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New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

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Vol. VIII. NEW YORK, OCT. 2, 1886. No. 14.

IT is noticeable that Western Union stock is higher in price, in sympathy with the general market. The special causes of its strength are not apparent, however. The latest report as to the intentions of the company is credited to Mr. Field, who says that it is accumulating a "war" fund of a few million dollars with which to buy up its opponents when the competition at low rates has worn them out. The picture thus presented is an ennobling one.

WE print this week the concluding portion of Mr. Irish's paper, in which he describes a new arrangement of the military telegraph wagon. The design adopted appears to be thoroughly practicable, and the improvements over the older forms are quite marked.

UNDERGROUND matters in Philadelphia are in somewhat better shape than they have been. The Electrical Committee of Councils has reported favorably on the ordinance permitting the local telephone company to bury its wires. But there is to be no unseemly haste. The company need not finish its work before 1890.

OUR illustrated articles this week take a wide range. They include a telephonic responder; an induction telegraph; a new incandescent dynamo; the water power plant of a Colorado electric light station; an electric railway; a small electric motor; an electric power plant; improvements in military telegraphy, and improvements in storage batteries.

BOSTON takes some pride in its elevator run by electricity, and is going to operate at least a score more that way, to begin with. The application is far from new, however, except to Boston. New York city has had such elevators for years, and Mr. Stephen D. Field ran one in San Francisco in the seventies. We are inclined to think that one of the largest fields of utility for the motor will be in operating elevators, especially in private houses and smaller office buildings that cannot afford the expensive plant now required.

ONE of the most interesting letters in our issue to-day is that from Mr. F. R. Welles, covering a communication from Felten & Guilleaume on the subject of European wire gauges. We feel under personal indebtedness to Mr. Welles for the trouble he has taken to elicit information regarding gauges, and for the manner in which he has enlightened us; and we know, too, that his efforts have been appreciated by a great many of our readers. All things considered, the opinion of Felten & Guilleaume as to the present and future pre-eminence of the millimetre gauge strikes us as well founded.

HITHERTO little or no use has been found in telephony for "responders" or "return signal" apparatus. And yet there appears to be a field for it. Thus Milwaukee has 34 per cent. of "lost" or "delayed" connections daily; Chicago, 17 per cent.; Washington, 11; Louisville, 10; Pittsburgh, 9; Boston, 8, and Baltimore, 7. These figures would imply that there is a great deal of unnecessary work and annoyance worth avoiding at a small expense, with devices such as were exhibited and described last week before the Electrical Section of the American Institute. The adoption of an appliance of the kind would doubtless add to the usefulness of the telephone, and benefit the exchanges in more ways than one.

AN item is now going the rounds of the press to the effect that "a German scientist, Herr Walter Hempel, has observed that the quantity of electricity furnished by a machine increases considerably when the latter works in an atmosphere of compressed air. A machine which under ordinary atmospheric pressure produces, for instance, 15 sparks per minute when turning at 400 revolutions, produces 32 when the pressure is increased to two atmospheres. By further increasing the pressure of the surrounding air the quantity of electricity generated increases in considerable proportions." It has long since been demonstrated that the distance through which a spark will pass in air decreases with a decrease in the pressure, and hence, following out the law, the inference would be that in compressed air the spark would leap greater distances. If both the machine and the spark terminals were under pressure, the experiment would evidently not prove any increased efficiency on the part of the machine; and these would seem to have been the conditions of the case. The specific inductive capacity of air varies so little with change in pressure that the increased effects noted must, we judge, have been obtained under the conditions stated above.

THE general revival of business has had its effect in increasing the activity that already prevailed in the electrical field. Perhaps the most striking development within the last month or two is that in electric street railways. About a dozen new roads are now building or under contract for construction. Montgomery, Ala., after a successful test, is to have a complete city system, equipped by the Van Depoele Company, which is also putting in roads at Scranton, Pa., and Port Huron, Mich. At Detroit, a new suburban road is on the point of going into operation, and work is laid out for the road around the pleasure resort at Belle Isle. It is stated that Pittsburgh will have a Daft road, and a Sprague road is to be constructed at Orange, N. J. Los Angeles, Cal., is now being furnished with two Daft roads, and another is seriously talked of for Coney Island. Other roads, to a large number, are in contemplation, and we should not be at all surprised to find a round fifty running or equipping by next summer. It is impossible to look at the roughest electric railway now in operation in this country without realizing the immediate practicability of the application and the large possibilities of improvement and economy as the work goes on.

AFTER nearly three years of study and deliberation, the manner of lighting the Bartholdi statue of "Liberty Enlightening the World" has been definitely decided upon. The plan adopted is one which is in conformity with the general design of the statue itself, and which will add to its beauty in a marked degree. The torch of the statue will contain 8 lamps of 6,000 c. p., the light from which will be thrown directly up into the clouds. This powerful beam, together with the cloud illumination, will constitute a beacon which will be visible probably a hundred miles out to sea, and will thus, afar off, be symbolic of the light and liberty to be enjoyed by the visitor to our shores. At the foot of the statue 4 or 8 lights of 6,000 c. p. each will be distributed. Their light will be reflected upon the statue and will illuminate it brightly. All these arc lamps will be invisible themselves, so that the objections raised by the river pilots against the blinding effects of the light will be entirely removed. Besides the arc lights all around the statue, the diadem upon the head of the figure of Liberty will contain incandescent lamps, to give the effect of jewels. The whole plan is undoubtedly an excellent one, and cannot fail to make the statue even more imposing at night than in the day-time. It is understood that the American system of lighting is to be used.

THE Mechanical and Physical Science Section of the British Association had a large part of its time at Birmingham taken up by papers bearing upon electricity. Of these, two devoted to latest developments in the storage battery, and given on another page, must attract attention. While the authors of one of the papers, Messrs. Drake and Gorham, have sought to improve the secondary battery by what might be termed improved methods of operation, Prof. Desmond FitzGerald has struck out on an entirely new line, and by removing the source of all the troubles, made means for their prevention unnecessary. Professor FitzGerald claims to have done this by eliminating the lead plate entirely as a constituent part of the storage battery, and in lieu of a support for the peroxide of lead, he has converted the latter into such a form that it requires none. "Lithanode," as the new substance is designated, constitutes a decidedly interesting factor in the development of the storage battery, and its numerous alleged advantages are well brought out by Professor FitzGerald. Not the least among these is the reduction in weight which can be obtained, and which has always been the goal for competitors in this field. What is wanted is a storage battery of light weight and large capacity. Its value as a storer and converter of energy will then be greatly increased and its application extended accordingly. It is interesting to note that by omitting the lead plate from the construction of his battery, Professor FitzGerald apparently obviates any interference with important patents bearing upon this subject.

THOUGH fifty years of study of the phenomena of induction had brought to light some of the principal applications of electricity of the present time, the advent of the sensitive telephone within the last few years opened up entirely new and unexpected fields of research. Much attention has especially been given to the phenomena of self-induction in a wire, Professor Hughes' experiments in this field being perhaps the most notable. There is, however, another direction in which active minds are now at work, and that is, the study and utilization of the inductive effects between wires parallel with and at a distance from one another. The telephone in its early life and work suffered principally from the proximity to telegraph lines; later on, however, the electric light wires carrying heavy currents were shown to exert such a powerful influence upon adjacent telephone wires that their paths had to be widely separated. It was such facts as these that pointed out the truth that the effects of induction between parallel wires was far greater than had been generally supposed; and the direct outcome of the recognition of the general principle has been the system of telegraphing to and from moving trains. When we were told by workers in this field that inductive effects had been obtained between wires 500 feet and more apart, the statement was accepted with due reserve. But when, as Mr. Wm. H. Preece hints, in his paper before the British Association, the telephone has reproduced the signals passing in a wire forty miles distant, we may well stop to ask, Can this be possible? It seems hardly conceivable that at such a distance, inductive effects, pure and simple, could be recognized by any means at our command; and until confirmatory experiments are made, we are inclined to believe that the earth shunted a part of the telegraph current into the telephone line, and so produced the effects observed. Even assuming this to be the cause of the phenomenon, the instance is a most remarkable one, and is worthy of the more extended research which it is now receiving at the hands of Mr. Preece, who is ever ready to follow up investigations of this class.

REVIEWS OF NEW BOOKS.

The Elementary Principles of Electric Lighting. By A. A. C. Swinton. Crosby, Lockwood & Co.: London. 29 pp. 10 illustrations. Price 60 cents.

Those who are familiar with the author's large work on lectric lighting will not need to be informed that the subject is one he can handle. This little work is elementary in every sense of the word, and its explanations are given in language of the utmost plainness and simplicity. The price is rather high in view of the quantity of matter, but when a man wants to understand a subject that is beginning to interest him, he does not often cavil at the cost of the information. Mr. Swinton's admirable little treatise will probably be read with avidity by many "anxious inquirers," who will then want his other book.

On the Treatment of Secondary Batteries.*

BY BERNARD DRAKE.

The possession of a reliable means of storing electrical power is now universally recognized. For electric lighting, whether temporary or permament, whether domestic or public, it is almost an essential—for the commercial application of electricity to motive power it is a necessity. The theory of secondary batteries or accumulators, by means of which this storage is attained, has already been so ably dealt with, and is, probably, so well known to all present, that it is unnecessary to enter into it in this short paper, the object of which is to bring to your notice some practical points of treatment which are essential, in order to render secondary batteries commercially reliable. These points have been arrived at by experiments carried on by Mr. Gorham and myself, in the course of the manufacture of the batteries of the Electrical Power Storage Company.

The three main difficulties which we had to encounter were: 1. The destruction of the lead grid or conductor. 2. The buckling or warping of the plates. 3. The falling out of the active material. These three failings, principally affecting the peroxide plates, militated seriously against the commercial success of accumulators, of which durability forms so important a factor. We, therefore, carried out a large number of experiments, with a view to ascertain their various causes, and, by removing them, to render the secondary battery with which we had to do as reliable for durability as it already was in other respects. Here I may mention that these failings, although common, were by no means universal. For instance, the E. P. S. accumulators in the Bank of England have been in use more than 2½ years, and continue to give excellent results. That they do so confirms the conclusions to which experiment has led us.

We will take first: (1.) The destruction of the lead grid or conductor. This was the most serious difficulty to face, as on it depended the life of the battery.

The prevalent idea was that it was due to overcharging; that after the peroxide plate was fully charged, any further charge caused an evolution of oxygen which rapidly destroyed the grid. We, therefore, proceeded to charge some cells without cessation in order to ascertain the exact amount of current which would entirely destroy the lead conductor, or grid. It was soon evident that the process was, at any rate, a slow one; but the experiment was continued, until the full prescribed current had been passed through, for more than two months. At the end of that time it was found that the lead conductor was practically as sound as before charging. The coating of fine peroxide formed on the surface was very thin; there was no sign whatever of buckling, and, further, the specific gravity of the solution, when the cells were left in their then fully charged condition, remained absolutely unaltered. The conclusion thence drawn was that the oxidization of the grid caused by charging only penetrated to a very limited depth, and then ceased entirely, and that the coating of fine peroxide formed actually protected the grid, not only from deterioration by overcharging, but also from local action hitherto supposed to be unavoidable.

It was then established that the life of the grids was not proportional to the amount of charging, *i. e.*, to the number of ampère hours *put into* a cell. Was it due to the number taken out? To ascertain this was the object of the next experiment. For this purpose a battery was divided into two halves, one of which (A) was repeatedly run out, and the other (B) was never discharged beyond the point at which the E. M. F. commenced to drop. This experiment also extended over a considerable time, but gave the instructive result that when exactly the same number of ampère hours had been taken out of each half, the plates in the first half (A) showed signs of expansion or growing, whereas in those of the second half (B) no change could be detected. The life of the grid then was also not dependent on the *amount* of ampère hours taken out, or on the work done, but on the treatment of the plates, first as to charging up, and afterwards as to total or partial exhaustion. Further, it was satisfactorily proved that there was no necessity to employ a conductor of unoxidizable material, providing the simple precautions were taken: 1st. To fully charge the cells. 2d. To avoid discharging them entirely.

The second point to be considered is: (2.) The buckling of the plates.

This had hitherto been attributed to two or three causes —charging too rapidly, discharging too rapidly, impurities in the acid or oxides employed. Experiment soon showed that the real cause must be sought for elsewhere. We found that the buckling was almost invariably accompanied by a hard white enamel (sulphate of lead) on the face of the plates, and further, that where the extra cells in a battery had received more charging than the remainder, the plates in these cells were frequently quite free from sulphate, and the consequent tendency to buckle, while the rest of the battery had failed. This proved that the enameling could be prevented by charging, and was not due to impurities in the oxides or acid used; further, that when the plates were free from sulphate there was no tendency to buckle. Experiment also showed that in the case of the first use of cells, when the acid was first put in, the specific gravity dropped in spite of the charging, indicating the formation of sulphate; by persevering in charging, the sulphate disappeared, and with

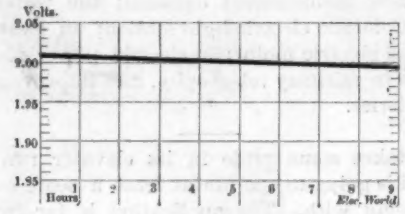


Fig. 1.

it the tendency to buckle. The conclusion was then that in order to avoid buckling of the peroxide plates, cells on their first use (whether new or after long disuse) should be charged incessantly until they are considerably overcharged. Hence the radical change in the instructions issued to users of the E. P. S. batteries. Whereas, hitherto they had been specially cautioned against overcharging, they are now urgently required to overcharge new cells, and to charge incessantly.

3. The separation of the active material. In almost every case where this occurred the plugs of active material fell out of the plates in complete halves and in a very hard condition; and analysis showed that they contained an

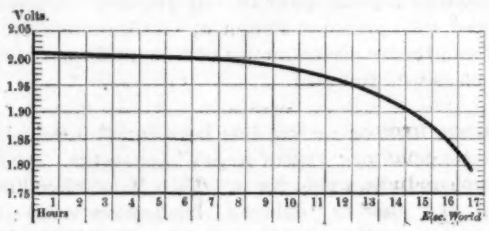


Fig. 2.

excess of sulphate, due, as before explained, to insufficient charging. On the other hand, in a few instances the active material was found to have become disintegrated and fallen off in a fine powder, and this was specially observable when, on account of a leak in the receiving vessel and consequent frequent addition of water, the solution had become extremely weak. In this case practically no sulphate was present, and the mass lost cohesiveness.

The conclusion is then that a certain proportion of sulphate in the material is necessary to bind it together, but that excess must be avoided. This due proportion once ascertained the third difficulty is overcome for all the ordinary work of secondary batteries.

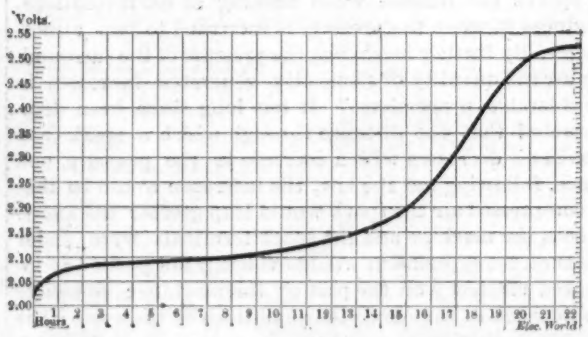


Fig. 3.

It should be mentioned, however, that there is a constant demand for an accumulator which can be discharged without injury at an abnormal rate for special purposes. Such rapid discharge results at present in the scaling off of the oxides and destruction of the plates, but as it causes the formation of sulphate, which is the binding, not the disintegrating, agent, the cause of the scaling, and, therefore, its remedy, must be sought elsewhere, and on this point discussion is invited.

I venture briefly to recapitulate the conclusions to which our experiments have led us.

1st. That the life of the leaden grids or conductors, and their freedom from buckling, are in no way dependent either on the amount of charging or discharging of the cells.

2d. That cells on the occasion of their first use, and also after long intervals of idleness, should be very fully charged, and in the first case incessantly.

3d. That they should never, under any circumstances be entirely run out, and in fact should not be discharged below the point at which the E. M. F. begins to drop perceptibly.

4th. That the coating of fine peroxide formed during charging is actually a protection to the plate against the injurious effect of overcharging, and against local action.

5th. That a certain small proportion of sulphate is necessary to give cohesiveness to the active material, but an excess of it causes the oxide to separate bodily from the conductor.

If the precautions here indicated be taken, we believe that the accumulators now made by the company with which we are connected will answer every ordinary commercial requirement during a very considerable time, but an accumulator is not at present known which, without sacrificing capacity and efficiency, will stand the extraordinary rate of discharge sometimes demanded. As we thought it might be of interest to give some reliable figures on the results which may be expected from cells as they are now made, we have, during the last few weeks, made very careful tests with some cells taken at random from stock and worked in accordance with the practical requirements of an electric light installation. It will be seen from the curve in Fig. 1, which is the mean of six consecutive discharges, that the E. M. F. is practically constant during a discharge of such duration as the cells would ordinarily be called upon to give, namely, 9 hours—the fall of electromotive force during this period amounting to only .02 of a volt. When the cells were discharged for 4½ hours, left standing for a day, and then discharged for another 4½ hours, the result was exactly the same as when the discharge was continuous, both as regards E. M. F. and efficiency. In fact, we were able to obtain a short time back from a similar cell, left fully charged for a month, an output of 380 ampère-hours. The charging of the cells under test was always continued for about an hour after the gases commenced to be given off, so as to comply with the requirements of our working instructions, and to keep the plates in good order. This naturally reduced the efficiency or return both in ampère-hours and watt-hours; but in spite of this overcharging the result of six consecutive charges and discharges gave an efficiency of 90 per cent. ampère-hours and 80 per cent. watt-hours.

Curve, Fig. 2, shows the capacity of the cells in ampère-hours when discharged at 25 ampères rate, and is the mean of two continuous discharges. It will be noticed that with 10 per cent. drop of E. M. F. the capacity is over 400 ampère-hours, and that the maximum output given in the lists of the company is reached with a drop of under 5 per cent. in E. M. F.

The curve, Fig. 3, shows the rise of E. M. F. during the charge, the current being throughout kept constant at 22 ampères. It will be seen that at the commencement of the charge the E. M. F. required was only 2.02 volts, that after 220 ampère-hours had been put in, representing about half the charge, the E. M. F. had risen to 2.13, and that when the cells were giving off gases freely the E. M. F. was as high as 2.53 volts. This curve will no doubt be of interest to those who manufacture dynamos for use with secondary batteries, as it shows clearly the range of E. M. F. for which provision has to be made if the current is to be kept constant. In most instances, however, we arrange for a maximum E. M. F. of 2.5 volts per cell to be charged, and allow the rate of charging to be diminished as the cells become full.

The cells tested were of the 15 L type, and contained 7 peroxide plates weighing 36 lbs. in all, and 8 of spongy lead weighing 33½ lbs. These plates are not made to give the maximum output from the minimum of weight, but the chief consideration is durability coupled with efficient working. They give a capacity of about 5 ampère-hours per pound of plate, which in the S type plates is increased to 6½ ampère-hours per lb. for tramcar work; and where durability is of minor importance there is no difficulty in obtaining considerably higher results. The internal resistance of a single cell was measured during discharge, and found to vary from .0012 ohm, when the cells were fully charged, to .0026 ohm when discharged, to 10 per cent. drop of E. M. F. This was tested by observation of the volts, first on open circuit and afterward discharging at a known rate, but owing to the tendency of the cells to rapidly recover their E. M. F. when left partially discharged, it is somewhat difficult to get reliable results after the E. M. F. has dropped to any extent. We are convinced that the above figures are absolutely reliable, as the strictest precautions were observed by Mr. Butler, the head of our laboratory, in calibrating the instruments used and checking the results. The current was measured by frequent readings from a Siemens dynamometer, checked by a voltameter, the two being found to agree within 1 per cent. The E. M. F. was measured with a reflecting galvanometer calibrated by means of Clarke's standard cells and freshly made Daniell cell, the total resistance of the galvanometer circuit being 40,000 ohms.

* Read at the British Association Meeting.

The Government Telephone Suit.

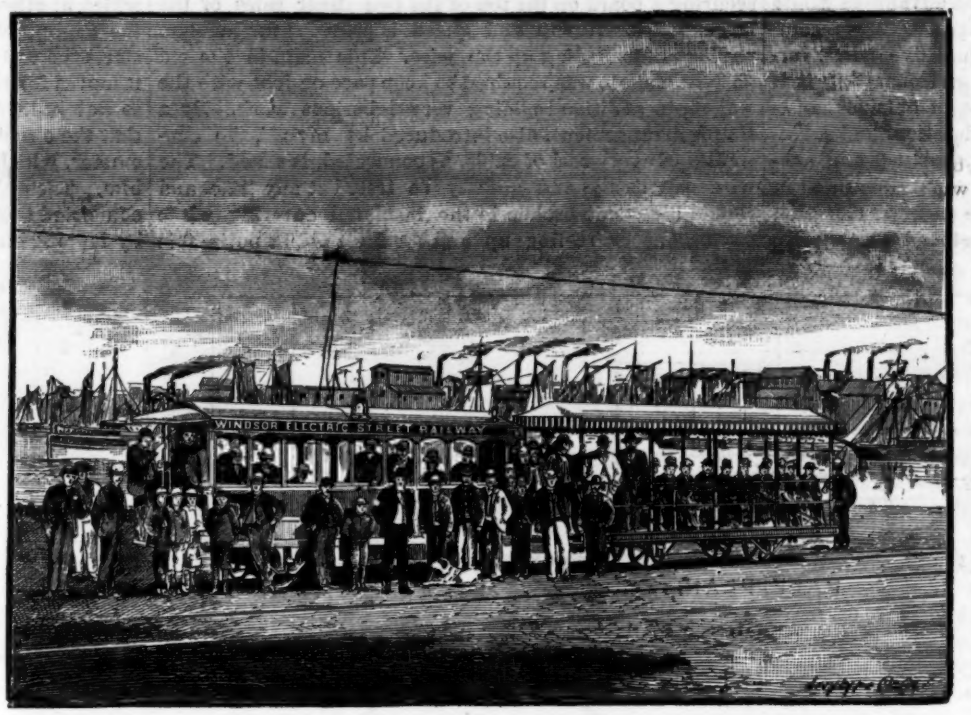
The preliminary hearings in the suit brought at Cincinnati by the Government to invalidate the Bell patents of the American Bell Telephone Company were continued through last week and brought to a close on the 24th. The argument related solely to the questions of the jurisdiction of the court over the Bell Company, the court

having ruled that it would hear the question of the sufficiency in law of the return under the motion, and it would hear the question of the truth of the return under the plea, one argument to cover the whole, and that it would frame its rulings so that neither party should be prejudiced by any mistake in question of form.

After argument by Messrs. Thurman, Chandler and Lowery, and Messrs. Storrow, Harrison and McDonald, Judge Jackson remarked that the court had a distinct impression as to the question at issue, but owing to the importance of the interests involved had desired to hear from counsel fully, and would examine any briefs which might be handed up. Owing to the effect which the decision of the question of jurisdiction might bear upon the demurrer of the local companies, argument upon the demurrer was postponed.

The Van Depoele Electric Railway, Windsor, Can.

In our issue of Aug. 14 we published illustrated descriptions of three Van Depoele electric railways. We now give an illustration of the road, on the same system, that has been operating at Windsor, Can., opposite Detroit, since June 6 of the present year. The road owed its construction to Mr. Tringham, a local electrician, who organized the Windsor Electric Railway Company for the purpose. Soon after the formation of the company, Mr. Tringham died, but in spite of the many troubles arising from this unfortunate occurrence, the road continued in operation, and is now doing so well that the plant is to be increased. The two cars used are shown in our illustration. The first is the motor car, and can be run singly. The track extends about two miles along the bank of the Detroit River from Windsor to Walkerville. It has been cheaply laid, but answers admirably. An overhead conductor is used, extending out from the poles on short cross arms, and the current is taken up by the small traveler shown and conveyed to the motor in usual manner, the rails serving as return. In the centre of the motor car is a 10 h.p. Van Depoele machine, boxed up, with removable cover, so that in case of necessity it is easily got at. The motor is controlled and belted to the axles in the ordinary way. The generating station is situated in a small factory building near the Windsor ferry, and consists of a Van Depoele dynamo driven by a Westinghouse engine. A speed of 12 miles an hour has easily been attained with full load of passengers in both cars.



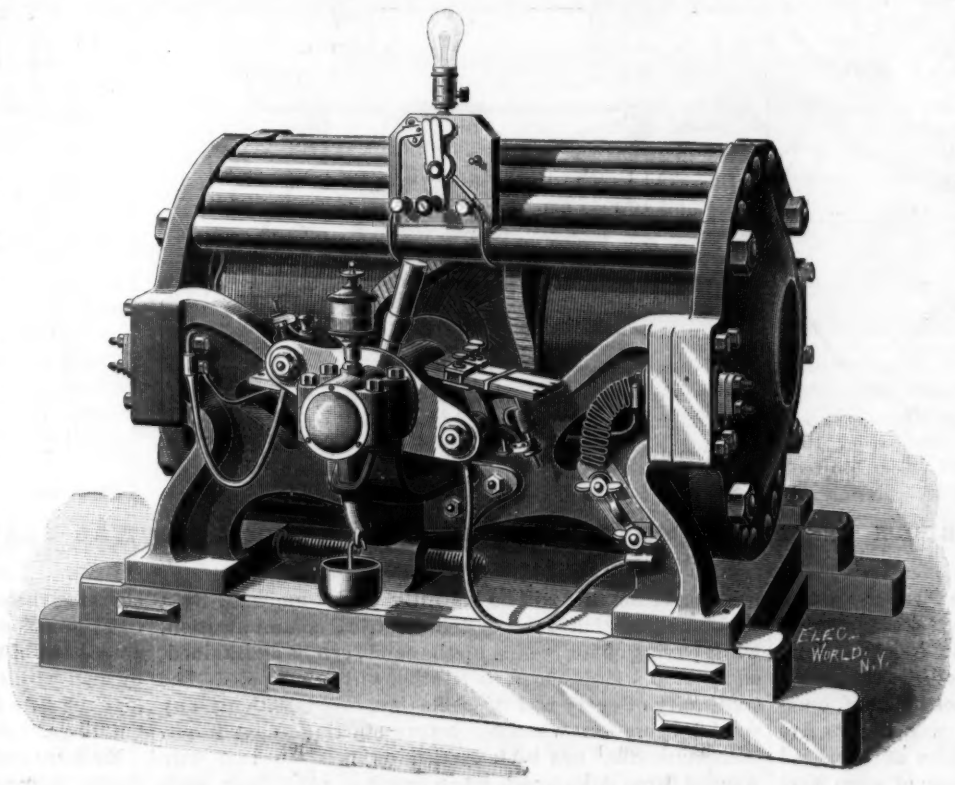
THE VAN DEPOELE ELECTRIC RAILWAY, WINDSOR, CAN.

The Thomson Incandescent Dynamo.

The Thomson-Houston Electric Company was among the first to introduce the system of placing incandescent lamps on arc circuits, but in order to meet the increasing demand for incandescent lights, Prof. Elihu Thomson has designed a dynamo to be used exclusively for multiple arc or incandescent working.

In the new machine, which is illustrated in the accompanying engraving, the design of the field magnets is similar to that in the arc machines; but while the spherical type of armature is retained, the three-coil winding of the arc machine is replaced by a winding similar to that of Siemens, with a commutator consisting of numerous segments, as usual in such machines.

The mode of winding the armature and making the connections to the commutator bars is, however, peculiar to the machine. The leading wires from the commutator bars are carried along the shaft into the body of the armature and outwards to its periphery, the joints to the armature convolutions being made on the outside of the armature near its centre line, or greatest periphery.



THE NEW THOMSON INCANDESCENT DYNAMO.

The armature core is constructed of rings of annealed sheet-iron piled together and carried by hubs on the shaft. The field magnets, although similar in disposition to those in the Thomson-Houston Company's arc light machines, are more solid and massive. The cores of the field magnets are wound only with wire which is placed in shunt, or derived circuit to the external circuit, but it will also be noticed that there are wo coarse wire coils situated between the field magnets, and directly over and around the armature, which coils also occupy an inclined position backward to the direction in which the armature rotates. The effect of these coarse wire coils is a double one. In the first place, since they are traversed by the main current of the machine, which varies with the number of lamps in use, or the load, they compound the machine or cause, by a direct magnetizing action on the armature, the potential of the machine to remain constant under varying loads. Again, by an adjustment originally made, the potential may increase to a determined percentage under full load. The second effect, or function, of the coarse wire coils is due to their inclined position, their plane of position not coinciding with a plane at right angles to the axis of the field magnets, but being displaced backward to the direction of revolution of the armature. It is well known that during the operation of a dynamo there is a distortion of the field magnetism due to the reaction of the currents in the armature upon the magnetism produced by the field magnets, and that the distortion is forward in the direction of revolution, necessitating the adjustment of the brushes on the commutator forward, when the current in the armature, or load, is increased. With the inclined coils in the Thomson-Houston machine, there is produced a counter distortion in direct proportion to the load, which neutralizes the distortion due to the armature currents, and results in the production of a machine whose brushes do not need adjustment during changes of loads. The compounding of the machine by a magnetic action directly exerted on the revolving armature core by the main circuit, gives rise to a new class of compound-wound dynamos, and the utilization of the same means to counteract the distortion and lead is certainly a new departure of considerable interest.

The machines are built either for maintaining a constant potential on the mains, or for giving a definite increase of potential, as the load is put on, so as to compensate for the fall occasioned by the resistance of the mains. Machines giving 75, 110 and 150 volts as standards have been constructed of this type with eminent success.

These machines have already been put in operation in various places and have shown themselves capable of taking care of the load without any external regulation whatever. This, evidently, is a great advantage, and reduces to a minimum the liability to trouble.

An Electric Motor Phenomenon.

At the recent meeting of the British Association Mr. W. M. Mordey showed an interesting phenomenon in connection with an electric motor which was accidentally discovered by him. A series wound machine—a 30 h. p. motor—was started by a large Brush machine acting as generator. The motor ran slowly and developed but little power. As there was apparently some fault the motor had to be stopped by taking one of the leads from the driving generator out of its terminal. The motor stopped suddenly, but instantly started running again backwards for a little while. An examination revealed that the fields of the motor instead of being joined in series with the armature had by mistake been placed as a shunt across it. The experiment was shown to the section and repeated by desire of some of its influential members. The motor ran first at high speed, then slowly after the shunt had been effected, and when the generating current was broken, it came to a stop instantaneously, being almost thrown over; it then made a few turns backward. When a motor is running, its electromotive force is, as it were, trying to send a current in the opposite direction to that which is being forced through its armature. On cutting off the supply current, this opposing electromotive force is able to assert itself, and the motor becomes converted into a generator. The momentum of the armature keeps up the motion for a certain time and causes the armature to generate a current which circulates through the armature and field. In fact, the shunt motor, under these conditions, acts like a series-generator with its terminals short-circuited; the momentum of the armature and of the machinery connected with it becomes quickly exhausted, and the armature comes to rest. Mr. Mordey stated that only in two cases should the braking power of the motor be utilized, viz.: (1) where accident could thereby be prevented; (2) where power could be utilized, and not merely be wasted.

Some Remarkable Telephone Experiments.

M. Henri Möhlenbruck, writing to *l'Electricien*, describes some very remarkable experiments which he has recently performed, and which seem to show that in the mesmeric condition an electric current may have a powerful inductive action upon the human nerves. The experiments were made with an apparatus consisting of a ring of iron wires, wound with silk-covered copper, the latter being placed in circuit with a microphone and a battery cell. The ring was about 9 in. in diameter. In the first exyeriment a watch was placed near the microphone, and the ring was put upon the head of the mesmerized subject. He immediately began to beat time with the ticking of the watch. When the microphone contact was touched with a quill feather he placed his fingers in his ears. The microphone was then removed to a distant apartment, and the connection of the circuit being completed as before, a violin was played in the distant room; the patient showed the most distinct indications that he heard the music. The next experiment was obviously to speak to the microphone. "To my great surprise," says M. Möhlenbruck, "the patient repeated the words." The last experiment described is that of sending a continuous current through the circuit. This had the effect of causing the patient to throw his arms around in a circle in the vertical plane. The direction of motion was reversed with the reversal of the current. When the patient was asked what he felt like, he said he was turning. M. Möhlenbruck concludes his letter by stating that he has made a great many more experiments not less interesting than these, and has constructed many different kinds of apparatus to aid in these researches. He promises to give further details if they appear of scientific value. We await these revelations with breathless interest. It is clear, however, that the interests of the Bell Telephone Companies are greatly prejudiced by these researches. In future we shall, says the London *Electrician*, be able to conduct telephonic communication with only a transmitter and a mesmerized boy. These researches, nevertheless, seem to bring out an important fact to which Sir Wm. Thomson has devoted some study. It will be remembered that he failed to notice any psychological effect on placing the human head between powerful magnets.

The Working of Uninsulated Lines by Means of Potential Plates and Military Telegraphs.

BY W. E. IRISH.

(*Concluded.*)

A short time ago the British field telegraph and signaling corps consisted of about 200 officers and men, twelve line wagons, each carrying three and a half miles of cable, as well as necessary tools and stores, four telegraph offices, each equipped with three Siemens polarized, field-pattern inkers, three sounders and three small, twelve-cell Daniell gravity batteries, with tools and stationery, and eight or ten wagons for carrying the baggage and stores, including a boat. The wagons were each drawn by four horses, driven by riders seated on the near side horses. It appeared to me that a great advantage would be gained if each wagon could be arranged to carry a complete equipment for a line of not less than five miles, furnishing everything for constructing and operating it if necessary, so as to be quite independent of outside assistance. I gave the subject some consideration, and subsequently, among other improvements, designed and submitted to the military authorities the wagon illustrated in Figs. 6, 7 and 8, which is shown in side and rear elevation and in half plan. This wagon was designed to carry five and a half miles of cable, in place of the three and a half miles carried by the wagons belonging to the service, or twenty miles of overhead wire, not including poles or insulators. In addition, it offered greater facilities for paying out or reeling up, and formed a section by itself, completely equipped for constructing and working its five and a half miles of cable, or its twenty miles of overhead wire. Eight reels, each carrying half a mile of wire, were supported in sets of four on each of the revolving drum carriages placed on either side of the frame toward the rear of the wagon. Two were carried, one on each side of the wagon frame, between the drum carriages and the box, and another was carried on the barrow underneath the wagon ready for use. In the space left between the two revolving drum carriages and the two spare reels on the frame of the wagon, thirty light iron poles in two sections, telescoping one within the other, are carried, as well as a light ladder, also in two parts, which can be easily and quickly jointed. A combined wheel and hand barrow, made to accommodate a reel of wire, to be employed in places inaccessible to the wagon, is carried underneath, always ready for use, and is shown in Figs. 9 and 10.

Office accommodation is formed by the wagon boxes, which at other times are used as seats by the seven men forming the detachment, and for holding the small stores, kits, instruments, batteries, etc. The boxes would be invariably empty when the wagon was required for office use, as on a line having been constructed, most of the stores will have been expended. The detachment would have erected their tent and removed thereto their kits. The office is formed by strapping the lids of the boxes to the hand rails and drawing out two hoops from the inside of the lids. Over these hoops is thrown, when fixed, the tarpaulin, (shown coiled up), which is otherwise employed for covering and protecting the cable.

The small door shown in the side of the box gives access to a quantity of stores frequently in demand; it can be reached from the ground, and avoids the necessity of mounting on the wagon. The tops of these boxes, placed one on each side of the wagon, form seats for the telegraph operators; a table is formed between the two seats by securing a board on the top of the two inner sides of the large boxes. A slip and guard is provided for the man paying out or reeling up the wire. This man, in the old pattern wagon, was required to keep pace on foot with the wagon, in addition to doing very laborious work. By a simple arrangement, also introduced by myself, the continuity of every reel of cable, as connected, is tested. The wire can easily and quickly be tested at any time, and should it become broken in the insulated covering while paying out or reeling up, and the fault not be noticeable to the eye, the fact will be instantly made known. By a slight modification of this system electrical communication, while paying out or reeling up the cable, can be maintained, and should a fault occur, its position will be indicated. The continuity of every reel of cable is proved without any special operation whatever before starting to pay it out. Communication has been carried on between two wire wagons three miles apart, when trotting away from each other at the rate of eight miles an hour, over a rough country.

The signaling equipment consists of two Siemens polarized recorders, two ten-cell batteries, a flag, a fog-horn, and a galvanometer. The tires of the wagon wheels are connected together metallically, so as to employ them for earth or ground. The wagon carries, in addition to the above, two each of the following tools: Spades, shovels, jumpers, sledges, picks, bell-hooks, axes, earth-plates, a cask of water, and wall and tree hooks for supporting the wire on buildings and trees.

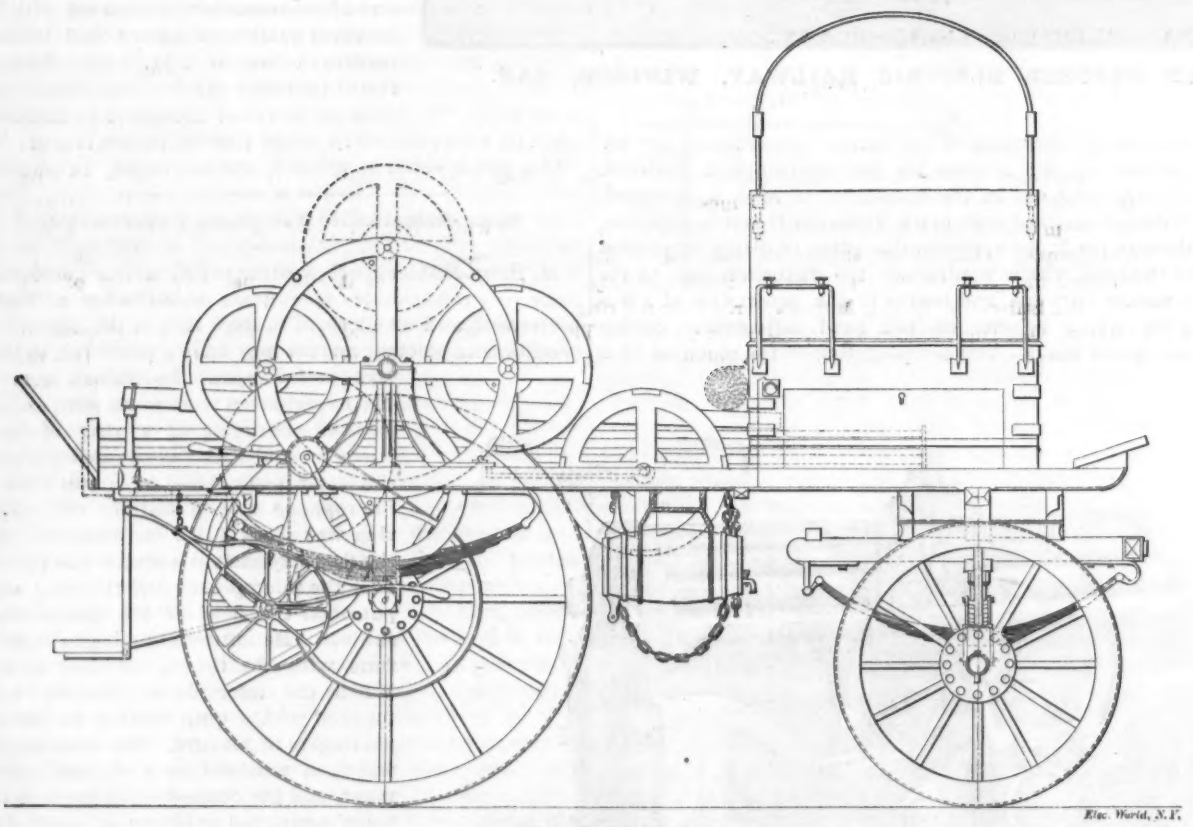
The most useful tools and those in greatest demand are placed where they can be most readily reached. Most of them fit into leather shoes or holders at one end, and are secured by a simple strap at the other. The small stores, tools and stationery, are carried conveniently accessible in the boxes. The reels of cable are supported by their spindles in bearings on the draw carriage and on the wagon frame; each outside end of the spindle carries a half clutch. Both hind wheels of the wagon have a smaller wheel built upon their spokes on the inner side, to be used as a driving wheel. A small sheave for driving the other half of the clutch is carried on an iron bracket on the frame toward the back of the wagon. Over the sheave a belt or band is hung in a convenient manner, to be easily slipped on to the driving wheel. The sheave and clutch are thrown in and out of gear by means of a lever operated by the man on the step. The band is only employed for coiling up, the wire being paid out by its own weight.

When paying out, the cable is connected to instrument, battery and earth, the circuit being closed through a galvanometer or recorder on the wagon and to ground again through the wheel tires. A man standing on the step—which at other times is turned up against the hind part of the wagon, where it helps to keep the poles in position—starts the reel revolving by a light touch. The wagon as it moves forward pays out the cable, the man's duty being to watch the reel and prevent its overrunning and to see that the circuit is always maintained through the galvanometer, which is fitted in the back of the boxes and faces him. The ends of the cable, as the reels are paid out, are connected to the next in succession, the joint being made by lapping one end of the bare wire round the other and covering the exposed metal with a hard rubber, water-tight junction. As the wire is paid off the reels, it is passed out of the way of injury on to hedges, fences, etc., by men with the aid of long crook sticks. At road crossings the wire is supported on poles and through towns on buildings.

Each man of the detachment is detailed to a special duty. When erecting poles, one man will obtain a jumper and force it into the ground where the pole is to be erected; a second man drives the jumper deep into the ground by means of a sledge hammer; other men at the same time are engaged in preparing the pole and attaching the guy-lines and driving pickets; another clamps the wire by a simple means to the insulator at the top of the pole; the latter is then raised, its base being inserted into the hole from which the jumper has been removed. The guy-lines are then made fast to the pickets, and the operation is completed, taking less time to do than to describe. At crossings where there is not much traffic, the wire is buried and stoppled down in the bottom of a shallow trench. When the five and a half miles of wire have been paid out, the detachment encamp, pitch their tent, picket their horses, form their office, get into communication with their base, and detail a patrol to guard the wire from willful or accidental injury and to remove faults. An empty wire wagon with a detachment is always left a

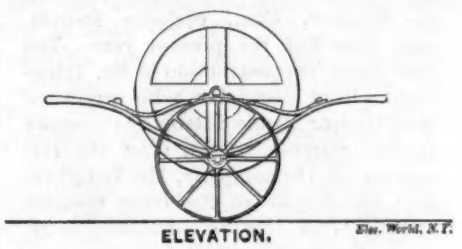
HALF-PLAN.

Fig. 7.



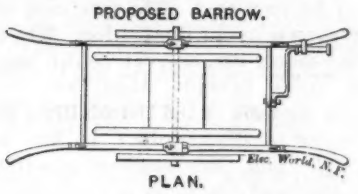
SIDE ELEVATION.

Fig. 6.



ELEVATION.

Fig. 9.



PLAN.

Fig. 10.

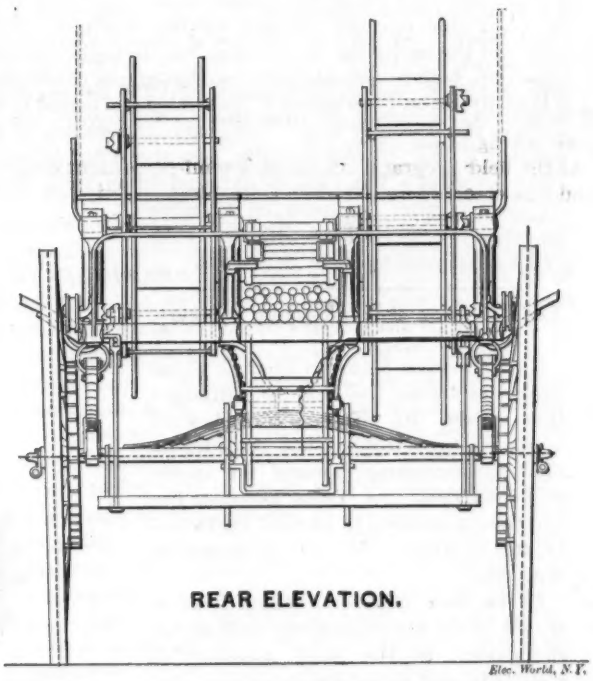


Fig. 8.

IRISH'S SYSTEM OF MILITARY TELEGRAPHY WITH POTENTIAL PLATES.

the base or rear, and if ordered to advance, takes up the line laid by the wagon first paying out from him and gallops with it to the front, paying it out again from the most advanced point which it in turn takes up. The first wagon to pay out its wire takes up in turn the wire laid by the second detachment, and so on. If the order is given to retreat instead of advance, each wagon and detachment will take up the line it laid. In taking up the line, each member of the detachment undoes all that he had previously done. Before reeling up the wire, the belt or band is put over the driving-wheel, the end of the wire is made fast to the reel and the clutch put in operation. The revolving of the hind wheel as the wagon moves forward, drives the belt, causing the reel, which is locked in the clutch, to revolve and wind up the wire. When the hindmost drums are full a pin is withdrawn, the heavy drum sinks to the bottom, bringing another empty one into position ready for coiling up. The wire is removed from the hedges, etc., poles are taken down and all made, as far as possible, clear in advance of the wagon, which follows, picking up the wire and stores. All tools, etc., taken from the wagon when erecting the line or at other times, are returned by those taking them,

As the field telegraph advances, a semi-permanent overhead line erected on poles takes its place. This line is built and worked by a distinct body of men, although belonging to the same regiment. There is nothing special in either their working or equipment excepting in the rapidity with which their work is executed and the zealous and untiring energy displayed by all. This applies equally to all branches of the military telegraphs.

Meeting of the Electrical Section of the American Institute.

The 86th meeting of the Electrical Section of the American Institute was held on Sept. 22, with President Vander Weyde in the chair. On account of the unavoidable absence of Mr. T. J. Perrin, who was announced to read a paper on telephone switch-boards, there was substituted a paper, read by Mr. P. Gannon, on a new "automatic return" signal for telephone circuits, which is given in another column of this issue.

As upon the day following the meeting President Vander Weyde was to celebrate his golden wedding anniversary, the members deemed this a fitting occasion to present him with some testimonial of their esteem. Accordingly, Mr. Frank W. Jones, being requested to take the chair, he, in a very happy vein, expressed the warm sentiments which the members bore toward the President, and then presented him with a purse of gold on behalf of the members. Dr. Vander Weyde was taken completely by surprise, and was evidently affected by this exhibition of good-will on the part of the Society. In returning his thanks for the kindness shown toward him, he dwelt upon the fact that he had devoted his whole life to the furtherance of science, and said that he should continue to work as long as it was in his power. He repeated his conviction that the amalgamation of the Society with the American Institute would prove beneficial, and that its influence would continue to spread.

Mr. A. A. Knudson, Chairman of the Board of Trustees, then read the conditions under which members are to compete for the prize of $50, offered for the best paper read before the section between the present time and Jan. 1, 1887.

Mr. J. M. Pendleton then exhibited the "telephone responder," which was described in our issue of July 18, 1885, and gave the details of some improvements and extensions in its application made since then. Among the latter Mr. Pendleton showed a "hotel service transmitter." This consisted of a dial having upon its face the names of 26 "wants" which a hotel guest would be likely to have. The dial is provided with an arrow, which can be set to any one of the wants. On the pushing of a button, the annunciator connected to the room is dropped in the hotel office, and the attendant can then allow the signal to come in and will attend to it.

The Water-Power of the Aspen, Col., Electric Company.

The important part which the availability of water-power for the running of electric light and power dynamos is already playing, was well demonstrated in the article on "Water-Power for Electric Lighting," which appeared in our issue of Aug. 21. When existing water-power is not situated near manufacturing centres where it would usually be taken advantage of, its availability for lighting purposes nevertheless remains. Among the numerous instances mention in the article referred to above was that of the Aspen, Col., Electric Company, who have just completed the installation on the Roaring Fork River of a pair of turbines of 150 horse-power, from which they are running both arc and incandescent lamps. The wheels, shown in two views in the accompanying illustrations, are 12 inch "Victor" turbines built by the Stilwell & Bierce Manufacturing Company, of Dayton, O. The turbines are arranged on a horizontal shaft, with cast-iron flume and draft tubes, the whole being mounted on a substantial cast iron bed-plate.

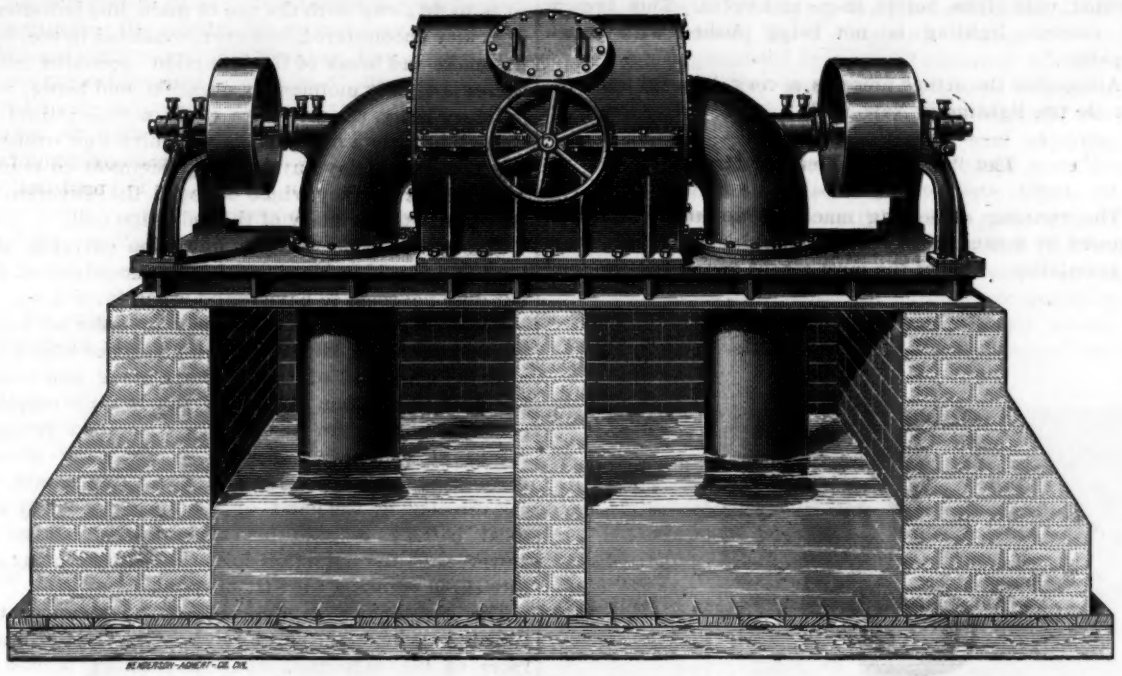


FIG. 1.—TURBINES OF THE ASPEN, COL., ELECTRIC LIGHT PLANT.

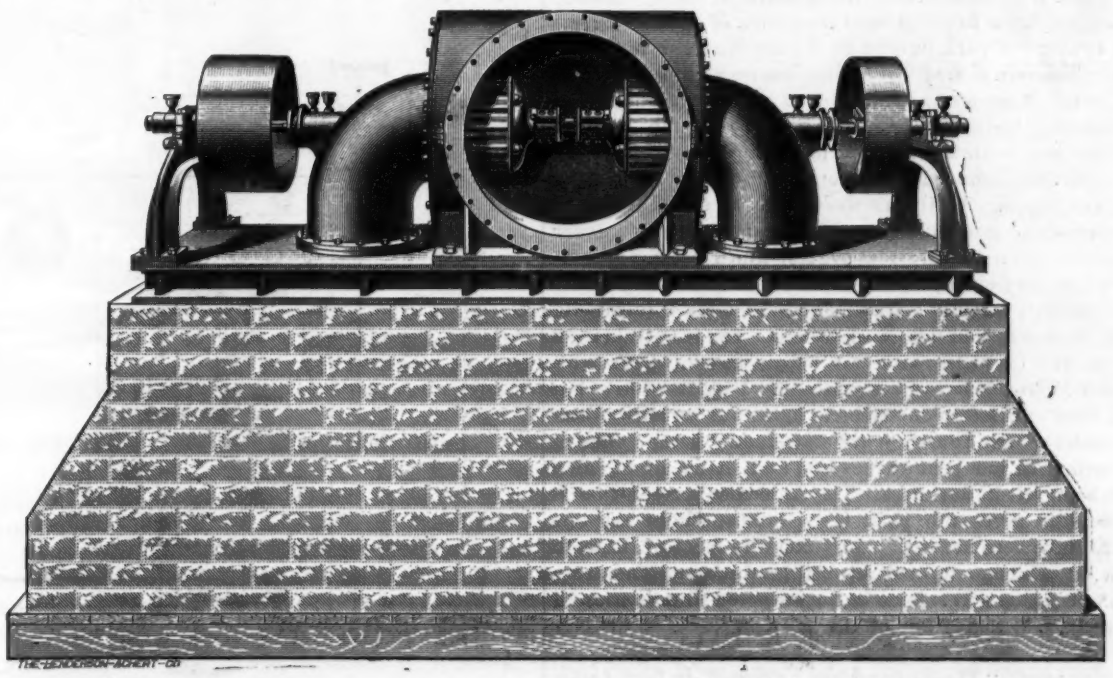


FIG. 2.—TURBINES OF THE ASPEN, COL., ELECTRIC LIGHT PLANT.

The wheels have now been in use about two months, and the entire plant has given most satisfactory results.

"The Main Line."

It does not often fall within the province of an electrical journal to discuss plays and playwrights. There is, it is true, an increasing tendency to employ electrical effects on the spectacular stage, but those effects, when spoken of in our columns, are described from a technical standpoint, with necessarily little regard to their histrionic or sentimental significance. In calling attention to "The Main Line," however, we are able to praise the piece, not only for its realism, dependent on a skillful use of electrical adjuncts, but for its originality of plot and material derived from the incidents of railroad telegraphy, and for its truth to character and the underlying motives of human life and action.

In their dramatization of the simple love story of "Possie" Burroughs, the operator at Rawson's "Y," a Colorado mountain station, Mr. H. C. De Mille and Mr. C. Barnard have shown the romantic possibilities of what to outward seeming is a life of mere drudgery and the sheerest prosaicism. It will be remembered by many of our readers that Mr. Barnard, in a tale published in "Lightning Flashes," has already given evidence of an intelligent appreciation of the literary value of the theme now resorted to; and it will not surprise them, therefore, to learn that the attempt to put the telegraph on the stage has been made so happily and successfully.

The wild, untutored heroine, quick with womanly instinct, but faithful to duty under all temptations, is admirably personated by Miss Etta Hawkins, who is to be congratulated on her dexterity and proficiency at the key. The telegraphic equipment of her office is thoroughly real. Overhead run the wires to Sandy River Junction—strung, we presume, by permit of the Subway Commission—and at the window hang the familiar Western Union signs. Regular blanks are in use; the old, peculiar phraseology of the "business" acquires a startling piquancy in its new prominence, and, like suggestive and reminiscent undertones, one hears through the play the tick-a-tick of the sounder and the singing of the wires. Not less realistic, it may be said, are the railway accessories, in depot, cars, switches, signals and sidings, and the conversation is often such as will make a train-dispatcher wonder who could have stood at his elbow with a stenographic note book.

The play is not overburdened, like some of this class, by its stage properties, nor is it, like others, an olla podrida of episodes without plot. It is a pure story of love. It is worked out ingeniously under unusual conditions, is full of pathos and humor, and is well mounted. The cast is a good one and the scenery a sufficient justification in itself for the reluctance of Possie's artist-lover to leave the mountains where he found her. If our readers want to see a play that will bring back old times to many or will give them an idea of the romance that lingers around their everyday occupation, they cannot do better than spend a couple of hours on "The Main Line" at the Lyceum.

A Thermo-Magnetic Phenomenon.

It is well known that at a high temperature iron loses its magnetic properties. It is therefore evident that if we take an iron ring and balance it upon an axis passing through its centre, then if we can keep one half comparatively cool while the other half is maintained at a red heat, the presence of a magnetic pole at the junction of the hot and cold sections should cause a rotation of the ring.

The idea is not new, and as a laboratory experiment it has already been carried out upon a small scale. In a recent number of the *Journal de Physique*, M. Schwedoff contributes a paper on the theory of this action, pointing out that it is quite evident that the motive power is derived indirectly from the source of heat, and proceeding to inquire into the successive steps of this transformation. In order to reduce the experiment to its most simple conditions, he considers first the case of a ball of iron suspended by a thread or wire in the neighborhood, say, of the flame of a Bunsen burner. A magnet is placed in such a position that its attraction draws the ball into the centre of the flame. As it grows hot the ball gradually loses its magnetism, and moves slowly away from the magnet and out of the flame. Here it begins to cool, and presently it slowly returns towards the magnetic pole, and this action may be repeated indefinitely. M. Schwedoff then proposes the use of the term *elastic force* in somewhat the same sense as the old phrase *coercive force*, only he distinguishes two actions tending to limit the value of the

co-efficient of magnetization; one, the inherent resistance of the material to any change in the relative position of its molecules; the other, to the increase of polar repulsion between the molecules when the magnetic action tends to give them the same orientation. It is to the former resistant effect that he alone applies the term "magnetic elasticity." Returning to the suspended ball, he supposes that in the neighborhood of a red heat the "co-efficient of the magnetic elasticity" increases directly with the temperature. Work is done upon the ball in the first instance in order to direct its molecules into magnetic orientation, and this work is done solely at the expense of magnetic potential. The action of the flame then tends to restore the molecules to their initial condition; this requires the expenditure of energy, which appears in the shape of an increase of the potential of the magnet upon the ball. In order to furnish anything like a complete theory it would, of course, be necessary to take account of the electro-magnetic reactions due to Foucault currents in the ball.

But the above simple explanation is sufficient to enable one to trace the order in which the transformation of energy takes place.

Electric Lighting in New York.

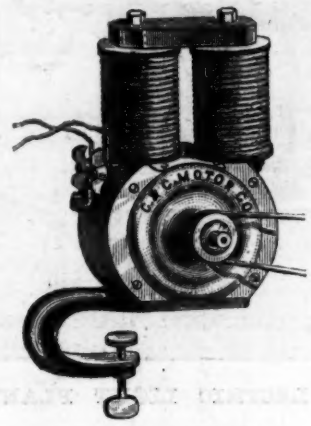
After all, electric lighting is yet in the days of its tender youth. One is apt to forget this in recording the countless installations and the endless improvements, but it is well to remember that an industry now representing a hundred million dollars was beneath the notice of the special compilers of the last United States census. The New York *Tribune*, in a recent interesting article, calls attention to the wonderful development in this city of "the electric light, which only six years before was an untried fancy in the brain of two or three inventors," and it gives a significant collection of figures on the progress of the business. "It seems like going back a long distance," it says, "to the time when there was nothing but gas lamps all over the city. Yet, in fact, the bulk of the arc lights was put in only between 1883 and 1884. The city had more than 22,000 gas lamps burning in 1879 and the cautious fathers turned a deaf ear to the appeals of all inventors to have the new light tried. In 1880 nearly a thousand new gas lamps were lighted, but after some hesitation the Commissioner of Public Works gave the Brush Company permission to fit out twenty-three arc burners at its own expense and experiment with them along Broadway. Thirty-two more were mounted the next year and the success of the experiment seemed assured. The United States Illuminating Company followed the suit of the Brush people in 1882 and put in seventy-three lights, most of them down town. It was in this year that the Union and Madison Square lamps were hoisted into position and became the two landmarks by night for the heart of the city that the twin lights of the Navesink Highlands are for its outskirts at Sandy Hook."

Coming down to the present time with 80 miles of streets and 41 acres of park lighted by 708 arc lamps, it remarks: "The Common Council, it seems, has no scruples of that sort, when it comes to the matter of public lighting. That enterprising body has already passed a resolution requesting the Gas Commission to put in through the city as far north as One Hundred and Twenty-fifth street some 2,000 new arc lamps. All the avenues, even B, C and D are to have electric lights almost from one end to the other, every cross street from Tenth street to Fifty-ninth street, Seventy-second, Eighty-sixth, Ninety-second and One Hundred and Twenty-fifth streets, Varick, Carmine, Grand, Elizabeth, Mott, Mulberry and a host of others. The Central Park drives are to blaze with 254 lamps, Bryant Park with 16 and Mount Morris Park with 12. Paradise Park has long been entitled to one electric light, but owing to the squabbles of the Fourth Ward statesmen for the honor of procuring it, the peanut-roasters and hand-organ men have been left in darkness. The Aldermen's resolution is kinder. It gives the park three lamps, where but one would have been needed." Any one who has seen Lincoln Park in Chicago lighted up brilliantly by its Thomson-Houston lights will rejoice in the proposed illumination of Central Park, to-day one of the unsafest places in the city after dark. As to the plans of the Edison Company, the *Tribune* says: "The demand has increased, in fact, faster than the supply. The Pearl street station ran up its capacity to about 12,000 lights, but stuck there, and a substation in Liberty street, with a capacity of 2,000 lamps, had to be opened in the summer just ended. In one way the company was able to retrench, taking out all lamps that could not be used more than four or five hours a day and putting in instead the all night or all day ones. Gas has fallen in price several times since the station has been working, but the managers say now that the prospects for extension are greater than ever. The Edison Company, in fact, hopes to have the whole city divided into working districts. A new station will be opened next to the Racquet club-house in West Twenty-sixth street, with a capacity of 50,000 lamps. Uptown, between Twenty-third and Fifty-ninth streets, will be cut into halves and 25,000 lights will be placed in each. Many of the hotels, theatres and flat houses have private plants now, and in the more inaccessible regions will have to keep them for several years yet. The Dakota, for instance, has an Edison plant of some 4,000 or 5,000 lamps. But the stations, if the Edison system is perfected, will do away with separate plants, and not only huge flats but single dwelling houses can be fitted up with incandescents." Of another representative company it says: "The United States Company supplies both arc and incandescent lamps, though its business is rather unequally divided between the two. The city takes 361 arc lamps from it, and it has some 900 other lamps scattered about the city. The arcs in the *Tribune* composing room, which one can see so clearly from the head of Centre street, are this company's. It also lights the American Institute's Exhibition Hall, many ferry houses and downtown shops. In a week or two the plant will be increased to 1,825, all of them of between 2,000 and 2,500 candle-power. The incandescent lamps it furnishes now number about 4,500. No private houses are lighted, only clubs, hotels, shops and cafés. This branch of electric lighting is not being pushed with much rapidity."

Altogether the article presents a very hopeful outlook for electric lighting in New York.

The "C. & C." Electric Motor.

The running of sewing machines and other light machinery by means of electricity is making rapid advances in popularity. One of the most recent apparatus designed

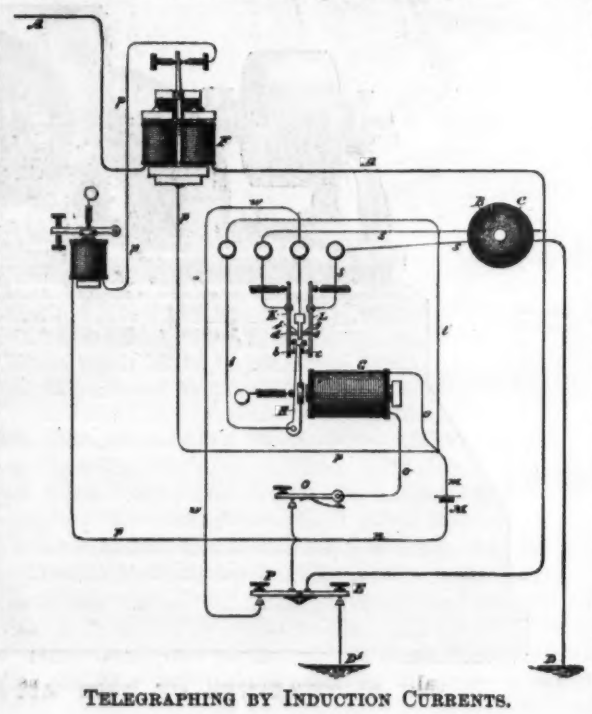


THE "C. & C." MOTOR.

for this purpose is a very neat and efficient combination of electric motor and battery made by the C. & C. Electric Motor Company of this city.

The motor, which is shown in the accompanying illustration, has been designed by Messrs. Curtis and Crocker, and is constructed to operate a sewing machine, being provided with a clamp for that purpose.

The little motor is series wound, having an internal resistance of .12 ohm, and is capable of carrying a current of 16 ampères with safety. At 2,000 revolutions it generates a counter E. M. F. of 6 volts, with the current of 16 ampères, and is said to exert a pull of five pounds on the



TELEGRAPHING BY INDUCTION CURRENTS.

circumference of the pulley, which is 1¼ inch in diameter. The magnet cores and pole-pieces are continuous, and are wrought-iron drop-forgings. The armature of the motor is of a novel construction, on the Gramme principle, and is completely inclosed, so as to exclude all dust and to keep it from accidental injury.

In connection with the motor there is made a battery consisting of two cells giving an E. M. F. of nearly 4 volts with a current of from 8½ to 10 ampères. The chemicals used in the battery are made up in the form of bricks, which are dropped into the cells filled with water and soon bring the battery up to its full work. This makes the handling of the battery very convenient for those inexperienced.

Another valuable feature is the method by which the speed of the motor can be regulated for fast and slow working. This is accomplished by suspending the zincs of the battery upon a lever so that they can be immersed to any extent or raised entirely out of the solution. The lever is operated by hand, and falls into different notches. The strength of the current, depending upon the extent of the immersion of the zincs, can thus be regulated to any extent, and with it the speed of the motor.

Arrangements are now being made by the company to build the motors for use on incandescent as well as arc light circuits.

A New Arrangement for Telegraphing by Induction Currents.

The Morse system of telegraphing by opening and closing the battery circuit, including the line, had not long been in operation before it was recognized that induced currents of high electromotive force might be employed so as to do away with the use of main line batteries. The difficulty encountered, however, consisted in the fact that the make and break of the induction apparatus generated currents of only momentary duration, and hence, with the ordinary relay, the armature could not be attracted long enough to form a dash. This difficulty was overcome by the polarized relay invented by Siemens in connection with a reversing key which changed the direction of the currents in the primary of the induction coil.

This system of working by induction currents has been used to a considerable extent in some countries of Europe, but does not seem to have found much favor here.

Recently Prof. Moses G. Farmer, in order to avoid the use of a reversing key, the manipulation of which is more arduous than that of the ordinary make and break key, has devised a system by which the latter is employed in connection with an electrically controlled reverser, by means of which the operation of reversing the current through the induction coil is performed by a battery, and not directly by the hand of the operator. Only a single local battery is used for operating the receiver, the reverser and the induction coil, the battery being divided into three branches for that purpose.

The accompanying diagram shows the apparatus and the arrangement of the circuits. The main circuit separates at the induction coil, one branch including the secondary *C*, and going to ground at *D*, the other branch leading to a switch-key *E*, the contact-plate of which is grounded at *D'*. In the main line is a polarized relay *F*.

The reverser which is used consists of an electro-magnet *G*, in face of the pole of which is a spring-actuated vibrating armature *H*. The free end of this armature is provided with contact-points *a a*, situated between contacts *b c*, and carried by two spring-actuated levers *K L*. Between the other contacts *d e*, on these two levers *K L*, is a pair of stationary contacts *f g*, and these parts are so related that when the armature *H* is moved slightly toward the magnet the contacts *c a* and *d f* are brought together and the others separated; or, when the movement is in the opposite direction the contacts *b a* and *g e* are brought together and the others separated.

The circuit of the battery *M* is divided into three branches. One formed by the wires *m n o* includes the magnet *G* and an ordinary circuit-closing key *O*. Another, formed by wires *m p n*, includes the sounder or other form of receiver, and is partly through the frame and armature-lever of the polarized relay. The third branch is formed by wires *m t* to the armature *H* of the magnet *G*, from whence it extends through the primary of the induction-coil *B*, by wire *s* and back to the battery by the wire *w*, the switch-key *P* and wire *n*. At the other station are the same devices arranged in the same manner.

The operation of the system is as follows: In order to transmit signals by means of the key *O*, the switch-key *E* is opened, so that the line or main circuit is grounded through the secondary of the induction coil. The switch-key *P*, on the other hand, is closed, so as to bring the contacts *f g* into connection with the battery. The key *O* is then operated to make and break the circuit through the magnet *G*. On closing the branch including this magnet, the armature *H* is attracted toward the magnet and a current sent through the primary of the induction-coil. This induces a current on the line which operates the polarized relays at the sending as well as the receiving stations. On raising the key *O*, the circuit through the magnet *G* is interrupted, a current impulse of opposite direction to the first is sent through the primary of the induction-coil by the reaction of the armature *H*, and the relay-armatures are shifted to their original position. When not sending by key *O*, the operator closes this key *E*, so as to short-circuit the primary of the induction-coil, and opens key *P*. The current impulses coming on the line operate the polarized relay and the receiving-instrument in the usual way.

Life-Saving Apparatus.—A dispatch of Sept. 11, from Washington says: Supt. Kimball, of the Life Saving Service, has returned to this city from Buffalo, where he attended the annual meeting of the Board on Life-Saving Appliances. A large number of experiments were made by the Board with various devices for saving life submitted by inventors, and much space is devoted in the report to a record of the tests made. Among the devices approved were the Dobbins marginal index for signals, Johansen's time detector or patrol clock and time detector key safe, and it was recommended that the Superintendent of the Life Saving Service procure and put in service these instruments. A large number of patented devices were turned over to special committees for trial, and reports will be made upon them at the next meeting of the Board.

M. Deprez's Power Station.

As we announced some time ago, M. Deprez's experiments in transmitting power a distance of 35 miles are still continued, and he is now working regularly every day transmitting as high as 50 horse-power. Great care has been bestowed upon the manufacture of the machines employed, and the generating station is equipped with all the needed appliances for regulation and measurement. Our illustration, taken from *La Nature*, shows the engine and dynamo room. The boilers are of the locomotive type and the dynamo is directly connected to a modified White's transmission dynamometer, by which the power transmitted from the engine to the machine can be measured.

A committee of the thirty-eight eminent scientists investigating the subject has recently made a report upon the installation and its working, from which it appears that the mechanical efficiency of the system is between 40 and 44 per cent. The electromotive force employed went as high as 6,430 volts, when the motor gave a counter E. M. F. of 5,081 volts, showing an electrical efficiency of 80 per cent.

Lithanode.*

BY DESMOND G. FITZ-GERALD.

The object of the present paper is to draw attention, as briefly as possible, to a substance for which it is claimed that it constitutes the negative element, *par excellence*, for voltaic batteries, primary or secondary, and also a perfect anode for the electrolytic separation of the most electro-negative elements, *e. g.*, chlorine.

The essential conditions in an anode applicable generally for electrolytic decompositions on a large scale are that it must be chemically unattackable both by oxygen and by chlorine in the nascent state; it must not disintegrate by the action of the gases evolved from its surface; surfaces of any required area must be obtainable without any liability to augmented resistance and consequent sparking and heating at joints in the material; it must possess sufficient hardness to resist abrasion by contact with ores, etc.; and its cost must be small. The applications for an anode fulfilling all these requirements are practically unlimited; but with the exception of the substance I now bring before you, there is no material possessed of all these desiderata.

This substance, termed lithanode, which for some time past has been known to a few electricians in this country and in France, is peroxide of lead in a dense, coherent, and highly conductive form, obtained, without any admixture of inert cementing or agglutinating material, and free from any contact with lead or other oxidizable body, by a process of which the original and essential features are described in my patent specification of April 15, 1885.

The question was, how to obtain a dense coherent plate of peroxide of lead without the use of any cementing or agglutinating substance of which the effect would be to augment fatally the resistance of the electrode? This question has received a practical solution only after many failures, some of which bore at first the appearance of success.

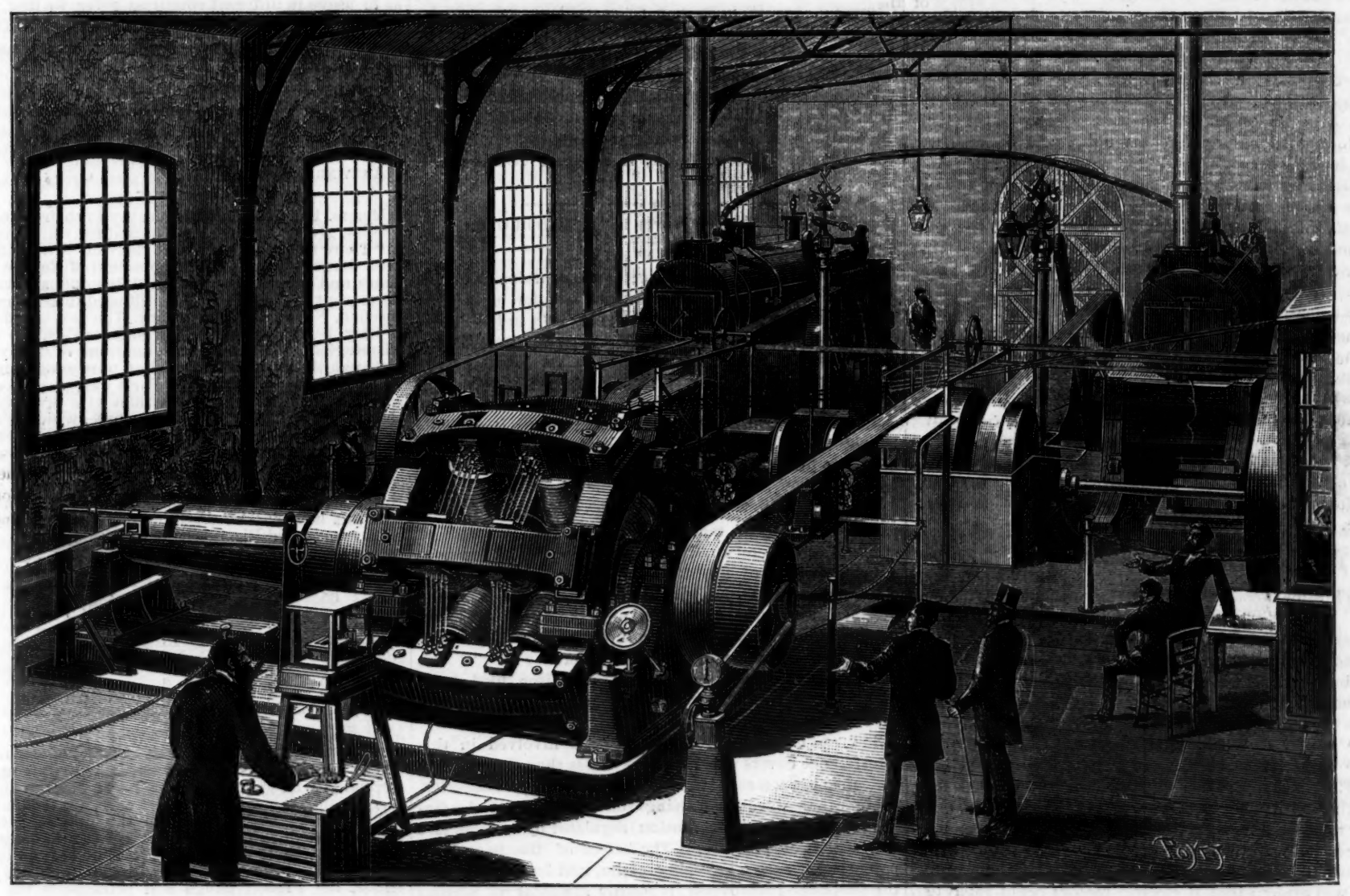
If we mix oxide of lead with water and mold the plastic mass thus obtained into the form of a plate, this, as might be expected, will be very friable when dry, and when immersed in a fluid will resolve itself into the original pasty form. In order to obtain a coherent solid, without the use of an inert cementing body, it is necessary to produce a molecular change in the plastic mixture, so as to cause it to "set." Such a molecular change may most readily be brought about by a partial chemical change occurring in the molded mass, provided such change be not too rapidly effected. If, for instance, we blend a certain proportion of finely-divided metallic lead with the oxide of lead and water, the re-arrangement of molecules due to the gradual oxidation of the lead in presence of air will have the effect of greatly increasing the cohesion of the mass so as to allow of its immersion in a fluid without disintegration. The resulting plate, when electrolytically peroxidized, will possess a considerable degree of cohesion and hardness constituting the product known to some electricians under the somewhat barbarous term of *peranode*. Better still—and this is the invention to which I would draw your attention—if we mix our oxide of lead with a solution of a salt which will gradually be decomposed by the oxide—as, for instance, ammonic sulphate, from which ammonia is evolved while a certain proportion of the lead oxide is converted into plumbic sulphate—we may obtain a dense and coherent mass which, when electrolytically converted into peroxide of lead, constitutes *lithanode*.

From what has been said, it will be seen that this substance is in chemical composition almost if not quite identical with the active material in the anodes of the various forms of secondary battery which have been proposed for use on a large scale. The difference is one of molecular constitution, allowing of the use of an anode wholly composed of peroxide of lead, and consequently entirely free from the liability to local action. Moreover, the anode in question—unlike those which may be constructed with chemically-produced peroxide of lead—possesses in sufficient degree the quality of conductivity, and will withstand without deterioriation and for an indefinite period the effects even of very rapid charge and discharge. When used in voltaic batteries, either primary or secondary, it offers a threefold advantage: first, it gives us a permanent element in lieu of one which contains the elements of its own destruction; secondly, it economizes the energy elsewhere expended in local action; and thirdly, it enables us to reduce the weight of the apparatus. The importance of this result does not need to be insisted upon in addressing electricians and electro-chemists. For the first time, we have it now in our power to construct an anode which with absolute impunity will withstand the test of a perfect voltaic negative—the electrolytic evolution of chlorine.

I have to apologize for the very imperfct manner in which I have been able to bring this material to your notice. Important improvements in its manufacture are in course of development; and I am unable, therefore, at the present moment to give more than a somewhat abstract view of the latest step that has been made in perfecting the secondary battery, and also the means for carrying out various processes of electrolysis on a commercial scale.

At the close of his paper, Mr. Fitz-Gerald exhibited an experiment which, he observed, was not *primâ facie* of a very scientific character; but which, nevertheless, implied a great deal in favour of the lithanode element. A couple constituted by a strip of zinc, and between two and three square inches of platinum foil, immersed in dilute sulphuric acid, was circuited through an electric bell without producing any effect. The platinum was then replaced by a narrow strip of lithanode, which was slowly lowered until it came into contact with the electrolyte—a gentleman present being requested to clap his hands the moment the lithanode touched the acid. It was pointed out that the sound of the bell commencing to ring and the clapping of the hands were simultaneous.

* Abstract of a paper read before the British Association at Birmingham.



THE DEPREZ POWER STATION, CREIL, FRANCE.

What Does the Decision Mean?

To the Editor of The Electrical World:

SIR: I notice in your report in your issue of this date of Judge Allen's decision on the application of the New York Electric Lines Company for a mandamus, that you make the same error contained in many of the daily papers.

The court did not decide that this company's franchise was a "mere license" and "not a contract." Right to the contrary of that, the court says: "The relator next claims that the act of 1885 is violative of the constitution, as impairing the obligation of contracts and taking away property without due process of law. It contends that the grant to it by the Common Council, having been accepted by it, became vested with the qualities of a contract. *This is true.*" The italics are mine, and nothing can be more plain than the import of the above words of the decision. Further on, the court says: "I do not think that Chapter 499 of the Laws of 1885 takes away or materially alters or impairs the rights which the relator possessed by way of franchise prior to the passage of said act."

I leave the readers of your journal to judge from the above extracts what the decision means.

SIDNEY F. SHELBOURNE, President.

Sept. 18, 1886.

Induction Between Wire and Wire.*

In Gray's Inn road, London, a telephone wire suffered induction from a telegraph cable 80 feet below in the ground, and the complaints induced Mr. Preece to arrange experiments on a larger scale. In Newcastle induction was noticeable at 3,000 feet distance. Experiments on the Durham-Darlington lines, and two other parallel lines, the one 10¼ miles east, the other 5¼ miles west, proved that on a Sunday, when all other traffic was stopped, a peculiar signal given on the central wires of 18 miles length could distinctly be heard at the four corners of the two other parallel wires, and moreover, Morse signals were heard which could only come from a line 40 miles away. Two other lines were therefore selected; one from Newcastle, 55 miles long, with 10 wires, the other from Gretna, 40 miles long, with 17 wires, the two being about parallel and 40 miles distant from one another. The wail produced by intermittent increasing and decreasing currents by means of a special commutator in the one line was sadly audible in the other. Mr. Preece did not consider these tests conclusive evidence of induction, because earth was used as return lead, although the respective line terminals were most carefully insulated. Another series of experiments is, therefore, now being carried on, with gutta-percha wires bent so as to form squares of a side of ¼ mile length. Two such squares have been placed on the ground ¼ mile apart; and what is intrusted to a telephone inserted in the one closed circuit, can be listened to in the other. If facts of this kind become known the telephone will not gain in favor. Cables are not much better perhaps; signals given in the one cable to the Scilly Islands have been heard in the other cable half a mile away. It is further intended to carry a special double line of copper wire to Wales. Professor Silvanus Thompson objected to the term induction, which has become the household explanation for a good many different troubles. As the earth was used in Mr. Preece's tests, and perfect insulation is a practical impossibility, the lines of force tapped at any two points must necessarily indicate current variations. Mr. Preece protested against having characterized the phenomena as induction phenomena. It was remarked that at the electrical tramway line at Giant's Causeway, a telegraph wire is only 28 feet from the conductor rail, and no induction effects have ever been complained of, although the postal authorities had to be satisfied about a great many points before agreeing to have the two lines so near one another. A test experiment was further suggested. Let us take three parallel wires, the one for the signals, the other two on the same side of the first for listening with a telephone at the one terminal; if we have to deal with conduction it cannot make any difference whether or not we join the two other wires by auxiliary wires, so that they form one complete telephone circuit; if it is induction, a difference must result.

Running Boston's Elevators by Electricity.

The Boston *Globe* has wide-awake reporters in its employ. Nothing of interest or in the shape of a new enterprise escapes the keen-eyed news-gatherers of that pushing and growing paper. The *Globe's* last Sunday edition contained the following interesting sketch, headed "Lifted by Electricity":

"In the building of the Union Institution for Savings, at the corner of Washington street and Hayward place, is the first elevator in Boston run successfully by electricity. It has now been at work nearly a month—long enough to prove its success to every one interested. A *Globe* reporter recently rode up and down on it and examined its workings with a care due a subject that promises to be of so much interest to the community, for it was evident that if electric motors could really do this work successfully, not only could many of the elevators now in operation be run more cheaply, but others would be made possible where now cost forbids. He found in the basement a five horse-power Sprague electric motor, scarcely three feet high, and covering a floor space not three feet square. This was running noiselessly and at a constant speed, but the speed dropped slightly for a moment when a heavy load was thrown on, regaining the normal speed at once; the result is much as if an elastic spring were employed—an important feature, as by it all sudden strains on belting and machinery are avoided, and wear and tear is reduced to a minimum. The power from the motor is here used to lift the elevator directly, by means of the ordinary belting, but it might be used for pumping water for hydraulic elevators under either the tank or the air pressure system. The motor runs all day, but only consumes an appreciable amount of electric energy when the elevator is raised. The throwing on of the belt by means of the ordinary wire rope had no perceptible effect on the motor. It is a 1500-pound elevator, used for freight, and runs at a speed of from forty to fifty feet a minute, going up five or six stories. One peculiar and important feature of its working is that when descending, its weight turns the motor armature and so converts the motor into a generator, supplying electric power back to the line. The power comes from the Edison central station, 200 feet away. Motors operated from this same station are now daily running ventilating fans, printing presses, circular saws, sewing buffing, and other machines in the neighborhood. It is expected that twenty elevators will soon be running by electricity."

* Abstract of a paper read by Mr. William H. Preece at the British Association meeting, Birmingham.

New York Subway Operations.

There is an abundance of rumor but very little solid fact or news in connection with the New York subways. A meeting of the directors of the Consolidated Telegraph and Electrical Subway Company was held on Sept. 27 at the office of the company, No. 61 Broadway, and it was resolved that Contractor John D. Crimmins should begin work on the section of the subway in Sixth avenue from Twenty-third street to Carmine street next morning. The Metropolitan Telephone Company submitted an amended copy of a contract to use space in the subways containing certain amendments required of it.

Daniel L. Gibbens, counsel of the Subway Commissioners, sent a communication to the Police Board stating that the Western Union Telegraph Company had taken measures to lay cables on Broadway without the consent of his clients. He claims that this is a misdemeanor, and asks the Police Commissioners to prevent it.

Corporation Counsel Lacombe, in an opinion to the Commissioner of Public Works on the validity of the permit issued by Mr. Squire to the Electrical Subway Commission, says that the controversy should be decided by the courts, as it furnishes no grounds for the revocation or withdrawal of the permit at this time.

Mr. Sidney F. Shelbourne, president of the Electric Lines Company, has brought suit to compel an acknowledgment of his alleged subway rights. The action is in the name of the New York Electric Lines Company, and the Subway Commissioners, Messrs. Flower, Moss and Hess, are joined as defendants with the Consolidated Telegraph and Electrical Subway Company, the American Insulated Conduit Company, and Contractor Crimmins. Argument will be heard by Judge Truax, in Superior Court Chambers, during the week.

Telephonic Interferences in the Patent Office.

To the Editor of The Electrical World:

SIR: Your journal of the 28th ult. contains an article headed "The Gray Caveat," in which mention is made of an interference pending since the year 1878 in the Patent Office between applications of T. A. Edison and E. Berliner, covering the broad invention of the carbon telephone transmitter. You state that there is "no way of verifying the statement unless one of the parties in interest shall choose to affirm or deny it," and that "so far as the Patent Office is concerned no one except the alleged parties in interest is entitled to any information upon the subject."

Now I claim to be able to give a good deal of information in regard to the matter in question, and this without going to the "secret archives of the Patent Office" for data. An examination of the accessible records of the Patent Office and copies of published or printed decisions in the original interference case concerning the telephone shows beyond a doubt that there is an interference still pending in the Patent Office entitled "Interference M." It was declared between the applications of Edison, filed April 27, 1877, Case No. 130 (applicant's number), and Berliner, filed January 4, 1877.

So far as can be ascertained the issue involved in this interference covers nothing more or less than the so-called "electric tension regulator" in a telephone transmitter, or in other words, "causing the vibrations of the diaphragm to act upon the tension regulator by increase and diminution of pressure." The effect of the issue of a patent with such a sweeping claim, and its bearing upon the telephone controversy, is readily apparent to persons familiar with the law of patents. In support of the statement that the above entitled interference covers the issue mentioned by me, I have only to invite attention to the fact that no patent has ever been issued in the United States for the broad idea or principle which was the subject of the famous suit in England between the United Telephone Co. and Bassano and Slater. In this case the English Court of Appeals decided recently that Edison was entitled to the use of any electric tension regulator in connection with a diaphragm; and even went so far as to hold that the defendant's tubular support for the microphonic contact blocks was a diaphragm. An examination of the records shows that Edison has obtained patents for the use of various substances, as "tension regulators," pulverized "lamp black," and "plumbago," for example; but his foundation case, No. 130, referred to in one of his patents as covering "means for producing a rise and fall of electric tension by the vibrations of a diaphragm" has not yet gone to a patent. The question is, If it is not the one in interference with Berliner, has Edison abandoned the invention disclosed therein to the public?

It is well known among solicitors familiar with telephonic matters that this "interference M" is held up somewhere in the Patent Office, and that it will remain in *statu quo* until the parties in interest are ready for a decision. The assignment records public show that Edison's case No. 130 was assigned to the Western Union Telegraph Company, and it is well-known that all of Mr. Berliner's inventions have been assigned to the American Bell Telephone Company. I do not care to go into matters of public gossip regarding the connection of these two companies in relation to the speaking telephone. I have simply stated facts obtainable from the accessible records of the Patent Office, and I now ask the question: Can the Patent Office allow contestants in on interference case to keep their cases alive for an unlimited number of years, and then when another controlling patent has expired, or been defeated in the courts, appear on the scene with a patent broad enough to cover the modern and only successful methods of transmitting articulate speech?

Ordinarily, I may add, a case in the Patent Office must be prosecuted within two years after the last official action, but in an interference this rule does not prevail. A former Examiner of Interferences held that parties to an interference controversy could not, by collusion or otherwise, unnecessarily delay a decision and award of priority of invention, but his decision was reversed by the Commissioner of Patents.

AUG. M. TANNER.

WASHINGTON, D. C.

The Wire Gauge Question.

To the Editor of The Electrical World:

SIR: At the risk of overburdening your pages with correspondence on the wire gauge question, I send you a letter from Messrs. Felten & Guilleaume, of Mülheim, near Cologne, the largest makers in the world of iron and steel telegraph wire.

It is only necessary to observe that the statements made as to usage in different countries refer to line wire, and not to sheet metal, fine copper wires, etc. The gauges mentioned as in use on the continent are all based on the millimetre system.

I only wish that their impression as to the tendency in America toward the adoption of the metric system were correct, but I fear there is little use hoping for so desirable a change.

F. R. WELLES.

ANTWERP, Belgium.

Messrs. Felten & Guilleaume say in their letter to Mr. Welles, giving him the information for which he asked:

"There is no doubt but that English wire gauges have been largely used on the continent of Europe in former times, and especially the so-called Birmingham wire gauge. At present this wire gauge is still used in Belgium, Russia, Sweden, Norway, and Denmark. The new standard gauge is only being introduced by degrees. In Germany, the Birmingham wire gauge was used up to the year 1873, although the ancient Westphalian wire gauge and also the French gauge or jauge de Paris were used besides, to a small extent. In 1873, the German wire drawers adopted the so-called millimetre wire gauge, which is at present used throughout Germany and Austria, other wire gauges only being used occasionally. The millimetre gauge indicates the size of wire by tenths of a millimetre, so that for instance the No. 42 wire would be 4.2 mm. thick, and No. 4 wire would be 0.4 mm. thick. Certain standard sizes are, however, adopted by preference, coming up very nearly to the old Birmingham wire gauge, say:

No. of millim. gauge:					100	94	88	82	76
Thickness in millim.:					10.0	9.4	8.8	8.2	7.6
70	65	60	55	50	46	42	38	34	31
7.0	6.5	6.0	5.5	5.0	4.6	4.2	3.8	3.4	3.1
28	25	22	20	18	16	14	13	12	11
2.8	2.5	2.2	2.0	1.8	1.6	1.4	1.3	1.2	1.1
10	9	8	7	6	5½	5	4½	4	3½
1.0	0.9	0.8	0.7	0.6	0.55	0.5	0.45	0.4	0.37
¾	⅜	⅛	⅜	¼	⅜	2			
0.34	0.31	0.28	0.26	0.24	0.22	0.2			

"As regards the system of measurement employed in Germany, wire gauges, *i. e.*, plates of steel with notches representing the various sizes of wire, are still much used in the works, but in addition the micrometer or screw gauge is much employed, allowing the measurement of the size of wire to the smallest fraction of a millimetre.

"In France, Spain, Italy, Switzerland, Greece and Asia Minor, the French gauge and principally the so-called Jauge de Paris of 1857 is used. This gauge indicates the size of wire by numbers having certain equivalents in millimetres and, contrary to the Birmingham wire gauge, where the smallest number indicates the largest size, in the French gauge the smallest number indicates the smallest size.

"The Jauge 'Japy,' similar to the Jauge de Paris, but with slightly smaller sizes for the different numbers, is also used to some extent in France and Switzerland; for the finer wires, card wire, copper wire, etc., the so-called Jauge 'Carcasse' is in use.

"With regard to Great Britain and the British colonies, they all now use the new standard wire gauge. In the United States of America, hitherto the Stubbs' Birmingham wire gauge has, we believe, been mostly used, besides Washburn & Moen's and Brown & Sharpe's wire gauges.

"If we are not mistaken there is a tendency in the United States to the adoption of the millimetre gauge. If this gauge should really be adopted in the States, the Americans will show that they are readier to take up an improvement than their English cousins, the millimetre gauge having been frequently proposed in England, but always declined on account of the conservative opposition it encountered. In South America both the Birmingham wire gauge or the new Standard gauge and the Jauge de Paris are used according to whether buyers have been accustomed to purchase in England or in France, the French imports of wire having of late been replaced by imports from Germany.

"We are used to sell in the export market to whatever gauge may be desired.

"In concluding, we beg to give you our opinion that the best system of measuring is the millimetre gauge, and that this gauge will be used to greater extent in the future; this will, however, greatly depend upon whether England will do away with her ancient system of measures, weights and money, and replace it by the far simpler metric system. This, we believe, is only a question of time."

Output of Telephone Instruments.

The improvement in general business has led to an increase in the output of Bell instruments. The statement of telephones sent out by the American Bell Company and of those returned, for the month to Sept. 20 and since Dec. 20 is an excellent one, as see the following:

Month to Sept. 20:	1886.	1885.	Increase.
Gross output	3,800	2,386	1,414
Returned	1,258	2,217	*959
Net output	2,542	169	2,373
Since Dec. 20:			
Gross output	31,761	24,590	7,171
Returned	14,660	19,567	*4,907
Net output	17,101	5,023	12,078

Compared with previous months:

	Sept.	Aug.	July.	June.	May.	April.
Gross	3,800	3,047	3,279	4,581	4,555	3,677
Returned	1,258	2,763	1,382	1,216	1,359	2,499
Net	2,542	284	1,897	3,365	3,196	1,178

* Decrease.

An Electric Light Company in Misfortune.

Financial and commercial circles were startled by the announcement from Hartford, Conn., last week, that Mr. Bartholomew, the president of the Charter Oak Life Insurance Company, and prominently connected with a number of industrial enterprises, had proved a defaulter and had fled to Canada. One of the concerns in which Mr. Bartholomew has had an interest, as president, is the Schuyler Electric Light Company, among the most energetic and successful of the younger companies in the field. The position of affairs is thus given by Mr. Spencer D. Schuyler, the organizer of the Schuyler Company, of which Mr. Bartholomew was president. "For three years," Mr. Schuyler said, "Mr. Bartholomew was practically manager of the company's affairs. A year ago I passed over to him a majority of the stock and he became actually, as before he had been practically, the leading man in the company. Nearly all of the company's officers live in Hartford. They had implicit trust in him. No one who knew him could help liking him. He was one of the sweetest old men I ever met, as gentle and kind as a woman. I believe the other officers made him banker for the company. They handed all receipts to him, and when money was wanted they went to him for it. If he hadn't cash he would give them his paper or indorse theirs. That was as good as cash, as he had unlimited credit. He controlled and handled the company's stock, which helped pay for plants that have been established in various cities. Now this stock and the cash he received from the company have been used in his various enterprises, I judge. If so, we will probably be getting light for months before we can know precisely how far we are involved. Offers have already come to us for several of the company's plants. Of course, buyers now want to get the property cheap. I don't believe it will need to be sacrificed. It seems probable, however, that the company's surplus, which was reported lately at $250,000, will be wiped out. That will be a serious, but not a crushing blow."

At the present time of writing, the indications are that the company will be able to weather the storm that has thus so unexpectedly burst over it, and will be reorganized to push business as vigorously as ever.

A special dispatch of Sept. 28 from Hartford says: "Some forty or fifty of the creditors of the Schuyler Electric Light Company, involved by the Bartholomew defalcation, held a meeting to-day. The liabilities of the concern are $320,000 and the assets $475,000. This sum includes the value to the company of contracts to fill which it now has much stock manufactured. The meeting chose a committee of five whose duty it is to confer and select such plan as in their opinion shall best serve the interests of the company in respect to securing ready money. The committee consist of Messrs. Willard, of Holmes, Booth & Haydens, of Waterbury; Charles Fosdick, of Fitchburg, Mass.; S. E. Elmore, of Hartford; William C. Simons, of Springfield; and S. F. Bagg, of Watertown, N. Y.

Automatic Return Signal for Telephone Circuits.

At the last meeting of the Electrical Section of the American Institute, Mr. Patrick Gannon, formerly Chief Electrician of the Compania Telefonica del Rio de la Plata, described the automatic return signal for telephone circuits of his design, by means of which a test of the condition of the line can always be obtained.

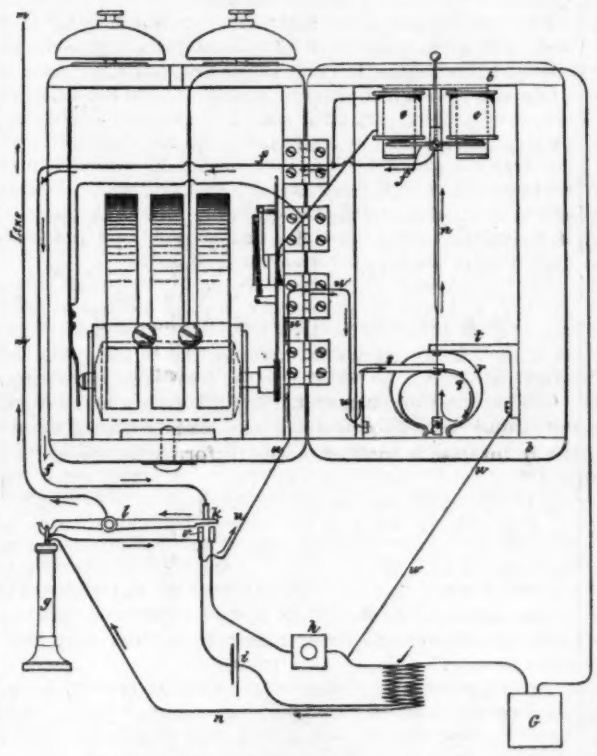
Mr. Gannon had charge of a telephone exchange of about 2,000 subscribers in Buenos Ayres, where the Gower-Bell telephone was in use, with battery call and trembling bells. As compared with the magneto call, this is an inferior system, but it, nevertheless, has one advantage, and that is, that the make and break at the subscriber's office can be heard by the operator or calling party. In practice, this amounts to a return signal, and proves of great advantage, as it gives a pretty fair indication of the state of the lines and bells. The night operator, before going off duty in the morning, passed a current through all the subscribers' lines in succession, as well as through his telephone, and made out a list of all those which gave him no return signal. The list was revised by 7 o'clock; by 8, the linemen and inspectors had their orders, and at 11 o'clock, as a rule, the morning faults were all cleared up.

Without the return signal, these prompt measures could not have been taken, and hence, although the American Bell Telephone Company also had an exchange in Buenos Ayres, at the time of the consolidation of both companies, a short time ago, the Gower-Bell had one-third more subscribers than the other, which Mr. Gannon believed to be due to the better service given, through the use of the return signal.

This advantage of the Gower-Bell system set Mr. Gannon to study the question of how the Bell magneto system could be arranged for the same purpose in a cheap and effective manner. The arrangement adopted for this purpose is a small addition to the magneto-bell in the ordinary telephone set, and is shown in the accompanying illustration.

As will be seen, the armature of the bell magnets *e e* has attached to it a pendulum *n*, which tapers down to a fine steel spring, and at its lower extremity it carries a bob *p*. On either side of the latter the ends of two suspended springs *r q* come together in close proximity, but without touching. One of the springs *r*, held by the brass bracket *t* is connected by wire *w* to one side of the microphone transmitter *h*, while the lower spring *q*, is connected through bracket *s* and wire *u* to the contact *v* of the telephone switch. This circuit includes in itself the local battery *i* and the primary of the induction coil *j*. It remains broken, however, at the lower ends of the springs *q r*.

Now, when the bells are rung from the central office, the pendulum is set in vibration, and the bob *p*, striking



GANNON TELEPHONIC RETURN SIGNAL.

against the inner spring, presses it against the outer at each swing, and so closes and opens the primary circuit of the induction coil, and the swing of the bob continues for a few seconds after the bells have ceased ringing. The make and break in the primary coil induces a current in the secondary, which is sent over the line and causes the well-known "clicks" in the telephone at the other end. The course of the secondary current is as follows: One end being connected to earth *G*, the current passes through wire *n*, through the telephone *g*, to switch-contact *v*, and following the same wire as the primary current *u*, passes through the spring *q*, then up through the pendulum *n*, through wire *f*, to the upper switch contact *k*, through the lever and thence to line *m*.

The attachment is evidently a very simple one, and as described by Mr. Gannon would not increase the cost of a telephone set 5 cents, while its advantages are numerous. By means of the return signal, faults in the lines or bells can be tested for at any hour. A partial ground can also be recognized; for it may be possible to ring the subscriber's bell, but his voice might only be heard very faintly. This, ordinarily, would lead the operator to believe that the subscriber's transmitter was bad; but, if the return signal also is faint, he may be certain that the fault is a ground on the line.

These and a number of other tests can be made with the return signal, which is evidently a desirable addition to the telephone.

Mr. Gannon also drew attention to the fact that the return signal could also be given without the battery by attaching a helix of wire at the end of the pendulum and allowing it to vibrate between the poles of a permanent magnet.

The instrument described above was shown in operation before the meeting, and elicited much favorable comment for its simplicity and effectiveness.

NEW YORK NOTES.

Office of The Electrical World,
New York, Sept. 27, 1886.

The Queens County and the Long Island City electric light companies are each trying to secure the franchise and contract for lighting Long Island City with arc lamps. The circumstances are somewhat perplexing. The Queens County company had its franchise granted by the aldermen and awaiting the signature of the Mayor two weeks ago. Since then the Long Island City company has also been dowered with a charter by the obliging aldermen. Last week one of the aldermen opposed to the Queens County company took advantage of the absence of two of its aldermanic friends and passed a vote to rescind its charter. This has now been declared to be illegal for various reasons, and we thus arrive at the *statu quo ante*. Truly there are many vicissitudes in life, and their multiplicity, as in this case, has its annoyance.

Just at this hour Long Island is pretty well interested in electric light matters. Has not the great *Eagle* swooped down on Mr. Charles Cooper and by its fierce screams of fraud and jobbery made the average man wonder what can really be the matter in moral and church-going Brooklyn? Up to the present time there have been but accusations on one side met by sturdy denials on the other. A great many people are now waiting to see proofs brought forth. Whatever happens, it is safe to say that Brooklyn will have as many electric lights next year as now—and a few more.

Talking of Brooklyn, too, reminds me that Tucker & Baxter, 40 Fulton street, in that city, are coming out with a new iron box bell embodying still further improvement. It consists of an iron frame, the box being cast in the frame with open back. The face of the box comes off flush with the top edge of box and holds all the working parts. The armature spring rests in a movable sleeve at one end, which allows of adjustment. On the face is a screw passing through the cover. On the end inside is an eccentric, so that you can adjust the armature to suit the magnet, when the bell is put in position, avoiding the necessity of removing the cover to adjust it from the inside. This bell is suited to all class of work. In any possible case of dampness, a piece of oiled silk, etc., can be placed at the back. The firm are now making up a large quantity of these bells to be ready this week, and they propose to sell them cheaper, they say, than any other bell in the market. In fact, I believe they are going to sell the 2½-inch size at 75 cents retail.

Mr. George Merritt, representing in New York the non-magnetic Waterbury watch, sailed from England for home on Sept. 21 per "Adriatic."

Messrs. Read & Giles, two young electricians of experience, have opened an office and salesroom at 112 Liberty street—an excellent stand, by the way—and they have begun business there under very favorable auspices as electrical engineers and supply agents. They have had considerable experience in the electric light field and are familiar with the details of construction and maintenance. I understand that they are prepared to make arrangements with the manufacturers of electrical apparatus and goods that with knowledge and discretion can be pushed to a good market. Their idea, as I catch it, is that it is better to take a few good leading specialties and devote time to them rather than to spread their energies "thin" over a large variety of miscellaneous articles. The point is a good one. I could put my hand to-day on a dozen first-class things languishing simply because the house representing them is so burdened with other business that it hasn't the time to look after them. Messrs. Read & Giles will win success because they deserve it. They are now prepared to supply electric light carbons, open-circuit batteries, and some other goods in the lines of telegraphy and telephony.

Charles A. Schieren & Co. are under the impression that their "Electric" belting is the kind of belting that electric light stations demand. The following little list of recent plants equipped with it certainly does bear them out: Bangor Electric Light and Power Company, Bangor, Maine; Nashua Electric Light Company, Nashua, N. H.; Boston Rubber Shoe Company, Boston, Mass.; Boston Cordage Company, Boston, Mass.; Edison Light Plant, Great Barrington, Mass.; Bates Manufacturing Company, Lewiston, Me.; Edison Isolated Company, Boston, Mass.; Beverly Electric Light Company, Beverly, Mass.; LaFayette Gas Company, LaFayette, Ind.; Edison Electric Illuminating Company, Cumberland, Md.

Ullrich & Co., No. 108 Liberty street, want every one of your readers to send for their circulars of "fountain" and "independent" pens. They do not understand how an electrician can be satisfied with anything less expeditious and convenient.

Mr. A. B. Laurence, 82 John street, has recently supplied Underwood belting to the Edison Machine Works, Goerck street—10 in. in place of 12; Dakota Flats, 11 in. in place of 12; the Young Men's Christian Association; the yacht "Radha"; the Schuyler Electric Light Company, Elizabeth, N. J.; the Elizabeth Theatre; Sergeant & Cullamore; United Edison Company, 65 Fifth avenue, and to other plants.

I note that the Bartholdi electric brush and ozone case are ready for the market. The Bartholdi Company have an exhibit of these goods at No. 102 Fulton street, and one can be easily satisfied there that there is no humbug, but that the goods do furnish a very neat and effective experiment in static electricity.

W. T. H.

NEW ENGLAND NOTES.

Branch Office of The Electrical World,
Boston, Sept. 27, 1886.

The report comes from Keene, N. H., that since the introduction of electric light in that town the gas company has reduced its rate per 1,000 feet to $2.50.

The Malden, Mass., Electric Light Company recently erected poles and ran a circuit between its station and Melrose, and on the evening of Sept. 22 the streets of the latter town were brilliantly illuminated.

The cost of equipping and wiring the handsome electric light plant at Milford, Mass., is said to have been upwards of $30,000. The adjoining town of Hopedale is wired in connection with the Milford plant.

At a meeting of the Cambridge (Mass.) board of aldermen on the 23d instant, a petition was received from the Cambridge Elec-

tric Light Company, asking for an extension of time until Oct. 15, in which to erect its poles. Granted, with the understanding that the wires are to be strung twenty feet above the ground.

The American Zylonite Company, at North Adams, Mass., is putting up a new brick building adjoining the main factory for its electric light plant. The incandescent system of the Edison United Manufacturing Company will be used, the lighting capacity of the plant being 400 16 c. p. lights.

The Bernstein Electric Light Manufacturing Company has been highly complimented on the handsome display of its lamps in the Horticultural Hall, Boston. Fourteen lamps of 30 c. p. each distributed throughout the hall afford a pleasing and perfectly clear light for the Aztec workmen, who form one of the principal attractions of the Mexican Fair.

The Edison United Manufacturing Company, through its New England agents, Messrs. Paine & Francis, continues to increase the number of installations in this section. The gentlemen named have alone installed nine isolated incandescent plants using the Edison system since the beginning of the present year. Among their new orders are the following: Worumbo Manufacturing Company, Lisbon Falls, Maine, 150 lights; W. K. Dana & Co., Saccarappa, Maine, 100 lights; American Zylonite Company, North Adams, Mass., 400 lights.

The Salem (Mass.) Electric Lighting Company is to-day one of the best equipped, and is among the most profitable, local enterprises of the kind in New England. It was organized under the Massachusetts laws, and started in December, 1881. In 1885 it adopted for the first time the Thomson-Houston system, and in the winter of 1885-6 it was running up to the full lighting capacity of 115 arcs and 150 incandescents. The plant has recently been enlarged and the company is now able to furnish 300 arc-lights of 2000 c. p., and 300 incandescent lights of 16 c. p. The city contract, which dates from Oct. 1, 1886, alone calls for 116 arc lights. The equipment of the plant comprises the following: Eight Thomson-Houston arc-light dynamos, six 45-lighters and one 30-lighter, three 100-light Thomson-Houston incandescent dynamos, two Fitchburg engines of 160 and 75 h. p., respectively, and a Hawkins engine of 60 h. p., together with two 150 h. p. compound tubular boilers. The stock of the Salem Electric Lighting Company is mainly owned by Salem business men, and the company has, it is said, paid dividends from the start. Mr. A. Morrill, the superintendent, takes great pride—and justly so—in his establishment.

On Sept. 16, Mr. Wm. Webster Burnham, the son of Mr. Louis W. Burnham, of the Electric Gas Lighting Company, was married to Miss Annie Carver Foster, of Newtonville, Mess The wedding was a quiet one; the families and a few friends of the bridegroom and bride were present. The young couple started on their honeymoon tour immediately after the ceremony, and before returning to Boston will pass a few weeks at one of the delightful South Shore resorts. The many friends of young Mr. Burnham among the electrical fraternity will be pleased to learn of his good fortune, and will unanimously join in kindest wishes toward both him and his lovely wife.

At the meeting of the Salem aldermen on Thursday, Sept. 23, permission was granted the Woodward Underground Telegraph & Telephone Company to lay cables underground in certain streets, under restrictions.

The American Automatic Fire Alarm Association of this city reports its business as being much improved over that of any other month during the past year. Since the beginning of August there has been a steadily increasing demand for this company's thermostats, and many of the customers are duplicating their orders.

The Jarvis Engineering Company, of Boston, has obtained the contract for resetting the boilers and laying the brick-work for the new machine shops of the Edison United Manufacturing Company, Schenectady, N. Y.

The Amoskeag Manufacturing Company, Manchester, N. H., has ordered the Entwistle-Wilder patent self-oiling pulley adjusted to all the machinery in the New Jefferson mill, in same city.

The Rodney-Hunt Machine Manufacturing Company, of Orange, Mass., is busy filling orders for turbines. Last Thursday the company shipped two 27-inch horizontal double-headed turbine water-wheels to Ticonderoga, N. Y.

Messrs. C. H. Brown & Co., Fitchburg, Mass., manufacturers of the celebrated "Brown" automatic cut-off steam engine, are now offering special inducements to promoters of electric light enterprises to give their engine a trial. Among the numerous orders recently filled for local electric light companies and isolated plants were the following: The Malden (Mass.) Electric Light Company; the Thomson-Houston isolated plant at Marsden's restaurant, Boston; the joint Berstein & Brush isolated plant at Shepard, Norwell & Co.'s, Boston, and the "Ball" isolated plant at McCullar, Parker & Co.'s, Boston.

The Jarvis Engineering Company, 61 Oliver street, Boston, have completed setting up the Armington & Sims Company engines at the shoe factory of Messrs. Ara Cushman & Co., Auburn, Me. They have also set a second boiler with the Jarvis boiler setting, and sold them a National feed water heater. The engine will be used to furnish power for a Thomson-Houston system of incandescent lights.

The Armington & Sims Engine Company, Providence, R. I., have more orders for their engines than at any time since they started in business. They are running nights to keep up. Their engines are for mill purposes as well as for electric lighting.

A New York dispatch to the *Post* says: The treasury stock of the American Electric Manufacturing Company, offered at par to the stockholders of the company to the extent of ten per cent. of their present holding, is being rapidly taken up. The proceeds of this issue of treasury stock are to be used in establishing and equipping a new factory in New Haven, Conn., with sufficient room and capacity to manufacture and supply the largely increasing demand for the new apparatus lately acquired by the American Company, which is now showing such great superiority over all other systems of electric lighting. It is understood that the company are now earning at the rate of twelve per cent. upon their capital stock, and that they will begin and continue regular dividends on and after Jan. 1 next. A large amount of outside capital has been offered to President Goff to invest in the manufacture of his apparatus, but he prefers to keep the entire benefits of the enterprise within his present company, if the stockholders take up the treasury stock offered, which now bids fair to be a success. It is understood that the new American apparatus invented by Professor Wood is exceeding the most sanguine expectations of Mr. Goff and his associates, and that a challenge will soon be made to every known system of electric arc lighting to meet the American system in an exhaustive competitive test. Mr. Goff says he is now prepared to meet his competitors in an open contest, and have the question of superiority finally and definitely settled. Mr. Goff further says: "My competitors must now show their colors, and put up or shut up."

The New England Wiring Company, of Boston, has gained a wide-spread reputation at home and abroad for the painstaking and conscientious way in which its work is done. The orders recently filled by the company are as follows: Boston Rubber Shoe Company's factory, Malden; Boston Cordage Company's mill, East Boston; Nashua (N. H.) Manufacturing Company's mill; Konautum (N. H.) Worsted Company's mill, and the elegant new residence of J. H. Appleton, at Worcester, Mass., all having been wired throughout for incandescent electric lighting. The company reports having orders for wiring work for incandescent lighting on hand from, viz.: Hon. Byron Weston's paper mill, Dalton, Mass.; American Zylonite Company's mill, North Adams, Mass.; W. K. Dana's mill, Sacarappa, Me.; Worumbo Manufacturing Company's mill, Lisbon Falls, Me.; York Mills, Saco, Me.; Stevens' mill, Haverhill, Mass.; Jackson Manufacturing Company's mill, Nashua, N. H.; Bates Manufacturing Company's mill, Lewiston, Me.; A. G. Dewey & Co.'s mill, Quechee, Vt.; Woonsocket Rubber Company's mill, Millville, Mass., and the attractive residence of W. F. Weld, Jamaica Plain, near Boston. W. I. B.

PENNSYLVANIA NOTES.

Lancaster, Pa., Sept. 24, 1886.

The thriving and busy city of Lancaster, Pa., may well be proud of possessing the banner Edison electric light plant of the day. Mr. P. B. Shaw, who has long been intimately connected with the promotion of Edison electric light interests, contracted last spring to build for the Lancaster Company "the best electric light station of its kind in the world," and he has well fulfilled his promise in the broadest sense of the word.

The main building is two stories high, 87 feet long by 47 feet wide, with a handsome front of pressed brick. It contains at present 4 Armington & Sims engines of 146 h. p. each, and 8 Edison dynamos, each having a capacity for 500 10-candle-power lamps, with all the very latest and most improved electrical apparatus. Everything in connection with the electrical part of the work was placed by Mr. Shaw, under the personal superintendence of Mr. W. S. Andrews, of New York, who, in the position of the chief electrical engineer to the Edison Company, that he has filled for many years, has had as wide and practical an experience in this line of work as any man living.

The boiler house is 37 feet by 45 feet, and contains four boilers of 140 h. p. each, and the smoke-stack, circular in shape, is 8½ feet diameter inside and 90 feet high. The entire structure is put up in a remarkably substantial manner, and is finely finished in every particular. Mr. H. B. Cochran is the general manager.

On Saturday evening, Sept. 18, at 6:30, there was a very interesting scene in the main building. Miss Rosa Sener, the seven-year-old daughter of Mr. J. Frederick Sener, opened the throttle of one of the Armington & Sims engines, and when the dynamos had attained their normal speed, Miss Miriam Sener, daughter of W. Z. Sener, a young lady who has seen but ten summers, closed the main dynamo switches, and for the first time the immense overhead system of conductors, containing over 60,000 pounds of copper, were charged with the current, and the lights were turned on for public use. Thus, at the hands of two little girls, were the citizens of Lancaster first given "the light that has come to stay!"

From a business point of view, this plant promises to be one of the most successful ever installed, the equipment being complete in every particular, the field for lighting remarkably good, and the public spirit of the inhabitants liberal and progressive.

WESTERN NOTES.

Branch Office of The Electrical World,
Chicago, Sept. 25, 1886.

Martin Irons, the leader of the Knights of Labor strike on the Missouri Pacific Railroad last spring, was arrested at Kansas City last Monday night, and will be taken to St. Louis to answer to the charges found against him in the indictment for complicity in tapping the private wire running into Vice-President Hoxie's residence. Owing to the recent ill behavior of the Master Workman, his bondsman has withdrawn from his bond, and he will be kept under arrest until his case is tried.

In Aurora, Ill., at a special meeting of the city council Thursday evening, that body decided to put in its own electric light plant for the use of lighting the streets. Aurora was one of the first cities to adopt the several-tower system of lighting the thoroughfares, and a five years' contract was entered into with a firm of this city, the price being $8,500 per year for twenty-six lights, the city owning the towers, poles and wire. That contract expires in November. The new plant will have sixty lamps of 2,000 candle-power each, two dynamos of 45 lamps of 2,000 candle-power each, an engine of 75 horse-power and a boiler to correspond, battery and pumping station, 20 miles of wire and 30 Brady mast arms for hanging lamps in the street—all this to be in complete running order for $50,000. The estimated cost of running the plant is $3,666 per year. The machinery will be located at the pumping-station of the water-works.

I make the following extract from an editorial entitled "Where Men Failed," which I find in last Sunday's issue of a local daily: "Last Tuesday an excursion train left Erie, Pa., on the Nickel Plate road, for Niagara Falls. It bore several hundred passengers, and, so far as the human eye could discern, there was every indication that they would have a pleasant day and an enjoyable experience. The train was running as an extra; its orders were clear, and the orders given to other trains were equally so. A fast freight was coming west at high speed. The train dispatcher notified its engineer and conductor that they were to go on the side track at Silver Creek for the extra. Both had copies of the telegram. They stopped at Silver Creek for a minute, and then, with the orders in their hands, they pulled out for the next station. The extra was coming at full speed, and, at a point three miles west of the place where the freight should have waited, the two trains met. In the crash several of the cars were telescoped. The baggage and smoking cars of the extra were driven together and nineteen of the occupants of the latter were instantly killed.

"This was a case where nothing failed but man. The telegraph conveyed its message unerringly. It was interpreted by the operator without mistake. The system of management was all that human foresight could have devised. But destruction came upon the train and death overtook the passengers because two men, endowed with reasoning faculties, with the knowledge of cause and effect and supposedly posted as to the necessity of obeying orders, paid no attention to the instructions which they had received. Against such recklessness as this the most careful management is of no avail. Time cards and schedules, telegraphs and signals, train dispatchers and operators, rules and regulations were all wiped out as by a breath when the two men in charge of the freight, bearing their orders in their hands, ignored them and moved on to ruin.

"The lives and limbs of all who travel by rail are in the keeping of mechanical and human agencies, the failure of either of which, as in this case, is almost certain to precipitate consequences of the gravest character. Yet so perfect has the system of railway management become that when disaster occurs in these days it is almost invariably the case that the fault is due to man and not to the inert agents which he brings to his service. A momentary absent-mindedness or carelessness on the part of a trainman, a stupid confusion of orders, or a reckless disregard for them, may cost a score of people their lives.

"There are men so constituted that their employment in the railway service practically invites disaster."

This is in the main well put; but I think that with the application of the railway induction telegraph, we would hear the last of such occurrences. Thus a train entering a given block or section could transmit a notice to that effect in either direction, or could receive intimation that another train had exercised the right of way; and I don't think that with such knowledge any engineer or conductor would try to run his train on a bit of line. Not until induction telegraphs are adopted, with their many advantages, will the "system of management" be all that "human foresight has devised."

C. O. Olson & Co., brokers and dealers in lubricating oils, 31 Milwaukee avenue, this city, are sole western agents for the Tracy patent automatic oil filter. This filter will clean all kinds of oils that have been used, and the oil drawn from the filter will be equal to that taken from the original package. The oil can be used at least thirty times without losing its body. It makes no difference what is in the oil—iron filings, dirt, water, grit, gum, acids, etc.—under all conditions the filter is guaranteed to do as represented.

The Municipal Electric Lighting and Construction Company of Minneapolis is busy and reports that it has contracted to put an Edison plant of 100 lights in the new building of the Minnesota State University. The following is clipped from a Minneapolis paper, relative to friend Huey, of the company: "The residence of Mr. George S. King, 1423 Eighth street south, was brilliantly illuminated last evening and filled with guests, on the occasion of the wedding of his youngest daughter, Miss Hattie, to Mr. Arthur S. Huey. Rev. J. A. Graham, of Trinity Episcopal Church, officiated. Little Misses Blanche Eddy and Maud Levering, prettily dressed in Kate Greenaway costumes, preceded the bridal couple to their places. Mr. and Mrs. Huey will be at home after Oct. 15, at 105 Thirteenth street south, on Fridays."

The National Electric Company, of Chicago, has been incorporated with a capital stock of $100,000. The business of the company consists in the manufacture of arc and incandescent electric light apparatus, and also iron towers and mast arms for electric lighting. The factory is located at Elgin, Ill., with main office in the Ogden Building, Chicago. The officers are: Hon. L. M. Kelley, President; Hon. R. N. Botsford, Vice-President; E. J. O'Beirne, Secretary and Treasurer; W. H. O'Beirne, Manager, and John R. Fox, Superintendent.

R. Segerdahl & Co., 152 La Salle street, Chicago, make some strong claims in regard to the merits of their "Champion" electric bell. They say it requires the minimum of battery. All the parts are fastened to one solid iron frame. Only the best Norway iron, annealed, is used, and all the iron parts are lacquered. Platinum contacts are used, and the brass parts are highly finished and nickel-plated. There can be no doubt that such an article as the "Champion" does much to recommend electric bellhanging to popular favor.

Col. S. G. Lynch, stockbroker, 146 La Salle street, Chicago, quotes Western telephone stock as follows:

Bell of Mo.	$150@$151
Central Union	44@ 46
Chicago	375@ 400
Colorado	20@ 22
Cumberland	70@ 75
Great Southern	25@ 27
Iowa Union	16@ 19
Michigan	67@ 69
Rocky Mountain Bell	40@ 45
United	16@ 18
Wisconsin	104@ 106

W. A. K.

Canon City, Col., Sept. 12, 1886.

In a recent number of The Electrical World was an interesting article on electric lighting by water-power. It deserves note that the plant at this point is operated by water-power obtained by means of a wing dam on the river, just below where the Arkansas makes its exit from the Grand Cañon. The Cañon Thomson-Houston Company has the contract for lighting the State prison located at this place, and has as well an increasing number of commercial lights in the town of Cañon City. The contract for public lighting has now been running a little over a month. The company has made the Denver & Rio Grande Railroad Company a proposal to light the Grand Cañon of the Arkansas, and there is a fair promise of acceptance. This, when accomplished, will give the tourist the grandest view to be obtained under such circumstances on the American Continent. It will many times over repay the road for the outlay, besides insuring safety and pleasure to the traveler. At present the Cañon is lighted by wood fires, and requires a corps of track walkers. Mr. Frank P. Blake is the superintendent of our company. A.

THE TELEGRAPH.

The Connecticut Electric Company is the new name by which the Connecticut District Telegraph and Electric Company of Waterbury will be known.

Trying to Collect His Pay.—Col. Robert G. Ingersoll, ex-Senator Roscoe Conkling, Edward Lauterbach and Henry J. Schenck were the four lawyers who looked after the interests of John G. Farnsworth in his suit as receiver of the Bankers & Merchants' Telegraph Company to recover $2,000,000 from the Western Union Telegraph Company for cutting wires of the former company. Mr. Schenck went last week before Judge Andrews in Supreme Court, Chambers, asking that John Wheeler, who was appointed referee to settle accounts in that litigation, be ordered to pay him $3,000 for his legal services. It was urged in opposition that a receiver is not allowed by law to employ more than one attorney unless the court allowed it. Mr. Schenck said that he was the only attorney in that suit for Gen. Farnsworth. Decision was reserved.

THE TELEPHONE.

Omaha, Neb.—The Western Electric Company has just sold another multiple switch-board. This one goes to Omaha, Neb.

The Sunset Company, of San Francisco, in its September list of subscribers, gives renewed evidence of prosperity. Since the last issue it has opened new offices at Agua Caliente, Altamont, Banta, Glen Ellen, Hazel Glen, Los Guilucos, Mares Island and Sonoma. It is said that the company is about to undertake some extensive underground work in San Francisco.

Sandusky, O.—The young ladies who distinguished themselves by their bravery in putting out the fire at the Sandusky exchange are Miss Flora Windish, Miss Gertie Henderson, Miss Annie Larmer, Miss Carrie Craig and Miss Jessie Porter. But for their promptness when lightning set the cupola on fire, there would have been complete destruction of the exchange. Mr. John W. Cherry, the manager, has gone to work to repair the damage, and has already succeeded in getting the service in good shape.

Bristol, Eng.—The Western Counties and South Wales Telephone Company is making vigorous efforts to secure new business. For a term of 4 or 7 years it offers to give service for residences in Bristol under one-quarter mile, actual wire, for $25 per annum; under one-half mile for $32; under three-quarters mile for $37, and under a mile for $43. This is an extremely low rate for a city the size of Bristol. The concession is open to those already subscribers to the exchange. The company has a number of pay stations, where it charges only four cents for three minutes' conversation.

THE ELECTRIC LIGHT.

Chattanooga, Tenn., is to have more electric lights.

Millville, N. J., is to be lighted by the Franklin (N. J.) Electric Light Company.

Iowa City, Ia.—The Iowa City Electric Light Company has been incorporated by Mr. Moses Bloom, as president, with a capital stock of $15,000.

Waupaca, Wis.—A special dispatch from the above place, dated Sept. 27, says: An unusual electric display occurred here yesterday, during a severe thunder-storm. The electric wires along Union street were so heavily charged with electricity that large balls of fire were suspended in the air just below them. Occasionally one would explode, and a number of persons in the vicinity received severe shocks.

The Ball System.—Through Mr. H. M. French, General Manager, the Ball Company, Boston, has made a contract with the proprietors of the Cyclorama of the Battle of Gettysburg there to put in a plant for the entire lighting of their building. A Ball 25-lighter, 10 ampère current, will be installed with a Southwark engine and a Hodge steel boiler. The same company is installing a plant at Stoughton, Mass.

Electric Lighting by Gas Companies.—The movement among the gas lighting companies toward electric lighting is spreading. Representatives of some eastern companies and others nearer this city have formed a syndicate, after taking expert testimony, to buy a controlling interest in the Fithian Engine and Electric Light Co., and the negotiations are so far advanced that it is probably only a matter of a few days when they will control it. Interesting developments in electric lighting may reasonably be expected from this new factor in the business.

A Sign of the Times.—"The most marked sign of the times in Massachusetts gas manufacturing," said a leading member of this interest, "is the way in which the companies are adding the branch of electric lighting to their business." The Charleston, Cottage City, Dedham and Hyde Park, Marblehead and Woburn gas companies have all had their charters changed so as to admit of furnishing electric lights, while one or two other gas companies, like that at Holyoke, have formed a separate corporation, composed of the same parties, to furnish electric lighting. A new company has been organized at Framingham to furnish both gas and electric lighting. In the opinion of good judges this movement is bound to grow just as rapidly as it appears that there is a field for electric lighting. There is nothing necessarily antagonistic to the interests of gaslight manufacturers in electric lighting. It will be a common thing in the near future for gas companies to make coal gas and water gas and furnish electric lights.—*Boston Com. Bulletin.*

Harlem, N. Y.—The Harlem Electric Light Company has been organized under the State laws of New York and is actually at work putting in a lighting station, with the purpose of making it equal to if not better than any lighting station in America. Mr. A. L. Soulard, the president of the company, is the acting and energetic chairman of the Board of School Trustees of the Twelfth Ward. He is also president of the German-American Real Estate Title and Guarantee Company, Mutual Life Building, and was for many years the president of the Sterling Fire Insurance Company, of this city. Mr. John H. Hapgood has made the contract for the work with the new company, and has placed orders for three one-hundred horse-power boilers, and two one-hundred and one seventy-five horse-power engines, heaters, pumps and steam connections complete. The company has contracted for over twenty-five thousand dollars for dynamos, lamps, etc., with the Waterhouse Electric Manufacturing Company, of Hartford. The Harlem Electric Light Company occupy the large four-story building, 242 and 244 East 122d street, where the steam and electrical apparatus is now being installed. The company is now ready to rent lights, and will be running in a few days.

APPLICATIONS OF POWER.

Blackpool, Eng.—The latest figures show this road to be increasing in efficiency and remunerativeness. During the week ending Sept. 11, the cars ran 2,760 miles and carried 44,306 passengers. The earnings were $1,735 and the total expenses $225.

Erratum.—By a slip of the pen, our editorial on the Sprague electric railway system made the work of an electric motor appear as in the ratio of the product of the *direct* E. M. F. into the difference between the direct and counter E. M. F. The word "counter" was evidently intended for the one italicized.

The Bridgeport Electric Light and Power Company, Bridgeport, Conn., contemplate changing their station and moving into a larger building. They intend to increase the size of this plant and add incandescent lights. They will also transmit current to run motors for printing presses and other machinery all over the city. They use Armington & Sims Company's engines, and three boilers are set with the Jarvis boiler setting, to burn low-cost fuel.

Baltimore.—A new company, with Mr. J. F. Morrison as president, and with a capital of $200,000, has been formed to manufacture the Baxter motor, dynamo and lamps, paying special attention to the motor. The company is now negotiating for land on which to erect a large factory, and will soon be in a position to turn out 500 or 600 motors per month. It is understood that Mr. T. McCoubray, Jr., will be the manager of the company. A large demand has already sprung up for the Baxter motor, but the present plant is barely adequate to meeting local wants.

A Printing Plant.—Mr. P. F. Van Everen, of 114 Nassau street, well known as a publisher of novelties in numbered forms, tickets, labels, small envelopes, and the like, has had a half-horse Sprague motor running on the Edison circuit, with the lights, for about two years. The motor was one of the first—if not the first—made by Mr. Sprague, and has been in steady use on a small Gordon press, but has not cost one cent for repairs since it was installed. The brushes have never been renewed. Mr. Van Everen found that electric power was the best for the peculiar conditions involved, and the motor has given him unfailing satisfaction throughout.

Toron'o, Can.—Speaking of the road laid down by the Toronto Electric Light Company at the exhibition, Mr. J. J. Wright says: "It was quite a success as to its running powers. During the exhibition it carried over 32,000 passengers, despite the fact that there was rain every day except one. After the first day's run the connections of the motor armature were changed, and the current used was only from 6 to 10 ampères—never more than 10. We found we had ample power even with that current, and accomplished great economy in fuel by the change. The machines, generator and motor alike, were practically cool after a heavy day's run. There was no waste at all in heating the armature or field coils."

Thrashing Corn by Electrical Power.—A further application of electric power has just been made on the estate of the Marquis of Salisbury, at Hatfield, by Mr. Shillito, the resident electrician. In this case Gramme machines have been used; the generator being driven as before by water-power half a mile distant. The Gramme machine is connected in the ordinary way to one of Clayton & Shuttleworth's thrashing machines. The result is highly successful in every respect, a very regular, rapid and noiseless power being obtained, in strong contrast with the ordinary steam engine, with its demand for skilled attention and for constant supplies of water and fuel. The new motive power is most promising; and, no doubt, a great saving in cost can ultimately be effected wherever the circumstances for the supply of power are favorable. Should a temporary stoppage of the machine be necessary, an ingenious arrangement has been made by Mr. Shillito whereby the current from the leads can be turned from the Gramme machine into a cluster of Swan lamps, so that a short break in the operations does not necessitate any communication with the source of power or stoppage of its regular working, and at the same time it gives warning to the men when the current is running.

MISCELLANEOUS NOTES.

The Union Switch and Signal Company, of Pittsburgh, have recently received some very large orders from the Pittsburgh, Fort Wayne & Chicago Railway.

A Remarkable "Freak."—In the country, not more than 15 miles from Modesto, Cal., resides a young lady who, we are told, has developed into a perfect electric battery. The first evidence to that effect that the young lady had presented itself to her a few evenings ago. She was about to retire, and extinguished the light in her room, and with a quick motion rolled back the bed covering, when lo, and behold! the bed was immediately turned into a sheet of fire. The young lady, much frightened, screamed "Fire!" and at the same time grabbed the bed covering in her arms. When the other members of the family arrived at the door of the room they found her standing in the middle of the room in the midst of what seemed to be a flame of fire, but no sooner had the bed clothes been taken from her arms than the flames disappeared. Experiments made by the young lady since have proved that she has become possessed of a vast amount of electricity, which shows itself at every opportunity. The young lady is not at all satisfied with the phenomena, as it requires the greatest caution on her part to keep from starting up a small bonfire by the slighest movement of her hands.

The Girls Giggled.—Dr. Rafael Asselta, an Italian physician, of No. 4 Marion St., this city, went into the telegraph office in the Occidental Hotel recently and asked one of the female operators to revise and read over to him a telegram which he had written out. He was in a great hurry, and his broken English was the more difficult to understand on account of his attempt to speak rapidly. Two young women in the office giggled, and Dr. Asselta swore at them. Michael Faghey, head waiter at the hotel, went to remonstrate with the angry Italian, and was promptly knocked down. When Faghey called for help Dr. Asselta drew a revolver and created a stampede in the hotel. Faghey and the other waiters ran out of the way as quickly as possible, while the young women in the telegraph office crouched on the floor and screamed. Dr. Asselta then went out into the Bowery and called a policeman, saying that he wanted to have the people in the hotel locked up. The policeman went to the hotel with the angry physician, who immediately sprang at Faghey and began to beat him. It required the strength of several men to overpower Dr. Asselta, who is six feet high and powerfully built. He was locked up in the Mulberry Street Police Station on charges of felonious assult and disorderly conduct, but he was admitted to bail by Justice Reilly. Dr. Salvator J. Lahy, of No. 7 Prince St., was accepted as his bondsman.

Trouve "Tied Up."—A correspondent of the London *Electrical Review* gives the following amusing account regarding M. Trouvé's exhibit at the Palais de l'Industrie in Paris: In a small circular basin at one end of the building, M. Trouvé shows his electrically-propelled boats. A rather amusing incident occurred the other evening to this gentleman. He had seated himself in his boat to commence his voyage around the lake (!), whose diameter possibly equaled twice the length of his vessel, and having turned on his power, away went the propeller round and round at a grand rate. The boat evinced no desire, however, to proceed, but obstinately remained stationary. M. Trouvé turned ahead, astern, he ported and starboarded his helm—no, the boat moved not. Such a thing had never happened before; his boat had always been well behaved. He grew excited, so did the spectators, but nothing would move that stubborn boat until a gentleman in the crowd stooping over, untied the cord which held it to the shore, and M. Trouvé with a beaming smile sailed majestically away.

PERSONALS.

Mr. Holroyd Smith, the engineer of the Blackpool electric railway, hopes, it is said, shortly to pay a visit to this country.

Mr. John W. Mackay is home in New York from his trip West, where he has been engaged chiefly, it is said, in furthering his telegraphic interests.

Thomas A. Edison says that it is better for intellectual workers to perform their labors at night, since in his case he is quite sure that his brain is in better condition at that time for experimental work.

Mr. John C. Crowley, a director in the Boston Union Institution for Savings, deserves much credit for his enterprise in being the first man in Boston to apply the new motive power to elevator service.

Mr. Robert Luce, of the Boston *Globe*, the author of "Electric Railways and the Electric Transmission of Power," has just published a manual called "Writing for the Press," which has won the commendation of some of the leading editors of the country. The Cincinnati *Enquirer* complimented it by reprinting nearly six columns from it in a recent issue.

SPARKS AND FLASHES.

The Side the Bread is Buttered On.—"Who is that poor, old, ragged-looking man, pap?"

"That's an inventor, child. He invents entirely new ways of saving time, money, and labor in the production of useful articles."

"Who are those gentlemen with big gold chains and diamond studs? They aren't inventors, are they?"

"No, dear, they 'improve' the machines the other man invented."—*Chicago News.*

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Western Union, b 72, a 72⅛.

Telephone.—Am. Bell, b 195, a 196; Erie, b 27½, a 27¾.

Electric Light.—No new quotations.

BUSINESS NOTICES.

Magnetism in Watches.—

THE UNITED STATES ELECTRIC LIGHTING CO.

C. C. WARREN, 216 *La Salle Street*
Manager Western Department.

CHICAGO, Feb. 10, 1885.

Messrs. Giles, Bro. & Co.:

GENTLEMEN: I have now been carrying my watch encased in one of your Anti-Magnetic Shields for about a year, and it affords me pleasure to state to you that notwithstanding I have been very much about dynamo-electric machines during the time named, the anti-magnetic case seems to protect the watch perfectly from the magnetic influence of the machines. I have not made any special electrical tests, inasmuch as I regard the good running of the watch as all that is necessary. I am thoroughly convinced, from the effect upon my own watch, that the case is an excellent protection, and I may almost add an absolute preventive of magnetic influence from external sources to the delicate movements of a watch. My watch is a Howard watch, and during the period of two or three years previous to encasing it with your anti-magnetic case it had varied to a very great extent, and I had it demagnetized on two different occasions. I regard your case as a complete success, and if my indorsement of same is of any value, you are at liberty to use it.

Yours truly,

C. C. WARREN, *Manager Western Dept.,*
The U. S. Electric Lighting Co.

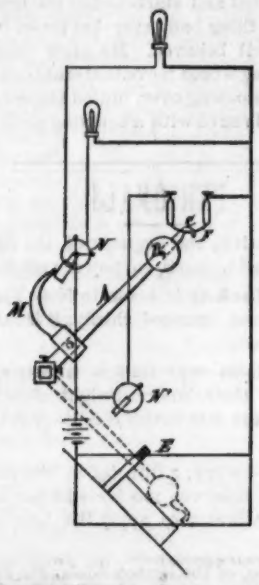
OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED SEPT. 14, 1886.

348,949. Electric Time Ball; John Böhling, Washington, D. C. He employs a glass rod upon which the ball is suspended, and causes the ball to drop by a slight rotary movement of the rod, the ball remaining stationary by virtue of its inertia and detaching itself from the rod.

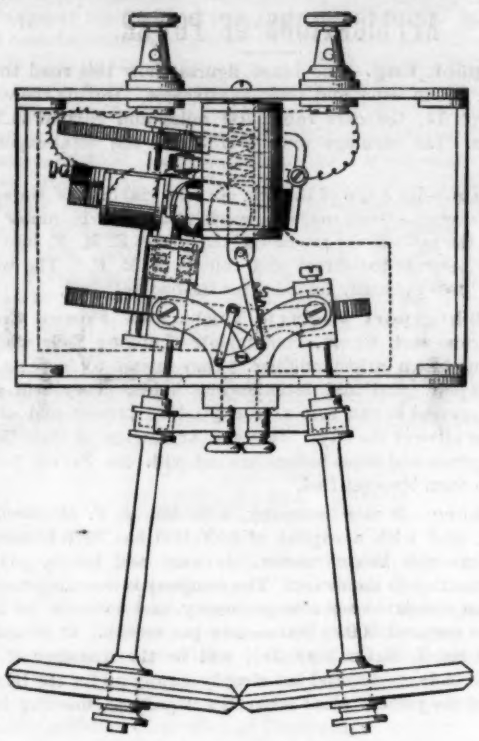
1) 348,971. (2) 348,972. (3) 348,973. Electric Lamp; Ed. Heymann and Frank W. Heymann, Boston, Mass., Assignors of one-half to J. I. Clapp, same place. (1) and (2) The inventions consist, essentially, in a lamp having discs of carbon or suitable material between the edges of which the arc is maintained, and an electromotor by which the discs are rotated continuously while the lamp is in operation. The discs are normally in contact when the lamp is not in operation, and means are provided for drawing them apart to establish the arc when the current begins to flow. See illustration. (3) Consists, mainly, in details of construction of the mechanism controlling the bodily movement of the electrodes relative to one another, and also in details of construction of the case or frame-work inclosing the electrodes and their actuating mechanism.

1) 348,977. Arc Light Regulator; (2) 348,978. Carbon Holder for Electric Light Lamps; P. O. Keilholtz, Baltimore, Md., Assignor to J. Frank Morrison, same place. (1) For illustrated description see The Electrical World, May 15, 1886. (2) The invention consists of a resilient clamp for surrounding the end of the carbon constructed with a compressible hollow ball or spherical enlargement, which enters a corresponding socket secured to the carrier-rod for the carbon. Two loose blocks or shoes within the socket together form an open concaved ring, encircling the enlarged portion of the clamp. A set-screw extends through the wall of the socket, and by pressing against one of the loose blocks compresses the spherical enlargement, and serves not only to bind the clamp in any required position, but at the same time it compresses the neck or the portion surrounding the carbon and causes it to clamp the same securely. In other words, the one operation of binding the clamp in the proper position serves also to clamp the carbon into the holder. A suitable cap is screwed into the end of the socket, and this is provided with a hollow screw-thread, which permits of its ready attachment to the carrier-rod.



349,109. Means for Operating Gas Meters.

348,994. Insulating Wire and Conductors for Electrical Purposes; T. J. Pearce and Melvin W. Beardsley, Oakland, Assignors to the Paraffine Paint Company, San Francisco, Cal. Relates to improvements in coating conductors with insulating material, consisting of a mixture of bi-sulphide of carbon and maltha.



348,972. Electric Lamp.

349,022. Telegraph Wire and Insulator Fastening; John Wilson, New York, N. Y. The insulator is made with a transverse notch or groove in the upper end, which is just wide enough above the bottom to admit the wire, and sufficiently wider in the bottom portion to allow the fastener, which may consist of a wire or a split tube, of rubber or other material, to be coiled around the wire in the enlargement, so as to chock the wire against escape by contact with the angular projections of the walls of the groove at the junction of the wider bottom portion with the narrower upper portion of the groove.

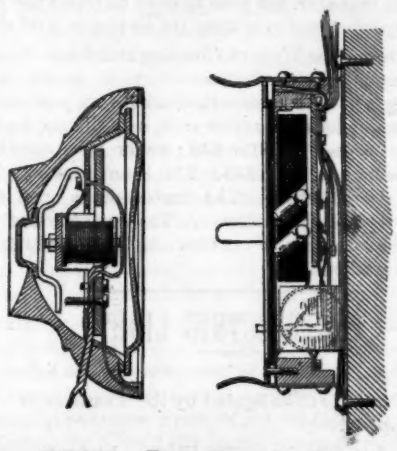
349,040. Railroad Signal; Wm. Hadden, Brooklyn, N. Y. The invention relates to the class of railroad signals in which a continuous electric current is employed for holding the signal-banners to indicate "safety;" and consists in the inserting in the circuits and removing therefrom of the resistance of one or more relay-magnets by the action of the magnet on its own armature-lever.

349,049. Telegraph Pole; J. E. Lippincott, Cincinnati, O. The object of the invention is to produce a structure of iron for this purpose which shall be strong, durable, light and economical in cost, and by its form and construction be less exposed to lateral strains due to winds, and which, by the nature of its constructive materials and mode of bracing between its integral parts, can be made at the shop in sections and readily transported to and put together at the desired locality.

(1) 349,041. Telephone System; (2) 349,042. Telephone; Cornelius Herz, Paris, France. (1) The object of the invention is the production of a house telephone designed to take the place of speaking tubes. The station apparatus, as shown in the illustration, consists of a microphone and induction coil firmly secured to the wall, and of a compound receiver and push-button which can be removed from the holding clamps. The invention further consists of an arrangement of circuits by which one station can call up any other one directly, without the intervention of a central station. (2) The invention consists of an apparatus shaped like the ordinary telephone receiver but containing within itself a transmitter, receiver and push button; constituting thus a complete apparatus for receiving and transmitting.

349,109. Means for Operating the Stop Cocks of Gas Meters; Leon Lenaerts, Brussels, Belgium. The invention consists in providing means by which the stop cock at the gas meter can be closed from any part of the premises. It also consists in means for supplying electric lamps when the gas is shut off, so as to avoid danger from the extinction of all lights. In the illustration *A* represents the wrench of the main cock in the gas-supply pipe of the meter. This wrench is made in the form of a lever of sufficient length to close the cock under the influence of the weight *B*. The lever is arranged in such a manner as to make only a quarter of a revolution. The upper extremity of the lever is made in the form of a hook *C*, which, when the cock is open, is hung on a fine-wire conductor *F*, fixed at its ends to two binding-posts, and communicating with the opposite poles of a storage or other battery. The strength of the wire *F* is such that, while at normal temperature it is able to support the lever *A* and weight *B*, as soon as it becomes incandescent by the passage of a strong current of electricity it is broken. If it be desired to close the meter, it is necessary simply to complete an electric circuit through the wire *F* by pressing on a contact-button *N'*, at any convenient point in the circuit. The current traversing the fine wire *F* promptly destroys it, and the weight *B*, under the influence of gravity, falls, drawing with it the lever *A* and closing the cock at the meter. To avoid the rebounding of the weight *B* on falling, a spring-dog *E* is provided, which maintains the lever *A* in its lowest position until released. In establishments which possess an electric lighting system the switch is arranged as shown. By the fall of weight *B* the circuit of such lamps as are now unnecessary is opened, while the switch *N* closes the circuit of the safety-lamps.

349,214. Telegraph System; Moses G. Farmer, New York, N. Y. For description see illustrated article on another page.



349,042. Telephone System.

349,222. Galvanic Battery; Benoit Jarriant, Paris, France, Assignor by mesne assignments to the Chemical Electric Light and Power Company, Portland, Me. The invention consists in the employment of bi-chromate of soda as a depolarizing agent in a battery.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.

George H. Pride, Electrician, Telegraph Engineer and Contractor, 9 Dey Street, New York.

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DYNAMOS, CHEAP—100 Light Incandescent, giving economy of 10-16 Candle per I. H. P.
25 Arc Lamps, steady and economical.
2 Light Arc Dynamos.
1 Small Plating Machine.
Address "DELTA," care Branch Office The Electrical World, 48 Congress St., Boston.

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Twenty-five pounds of No. 33 B. & S. Gauge German Silver Resistance Wire, English make, and 100 or more Magnets, 1,200 ohms each; size of core, ¾ diameter; length, 2 inches; diameter of head, 1¼ inches. A. S. BUNKER, 280 Common street, Lawrence, Mass.

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Manufacturers and users of Electric Gas Lighting Apparatus having information concerning patents No. 119,561, Oct. 3, 1871, and No. 194,328, Aug. 21, 1877, to A. L. Bogart, under which heavy royalties are being collected, should immediately address "JUSTICE,"
Care The Electrical World, New York.

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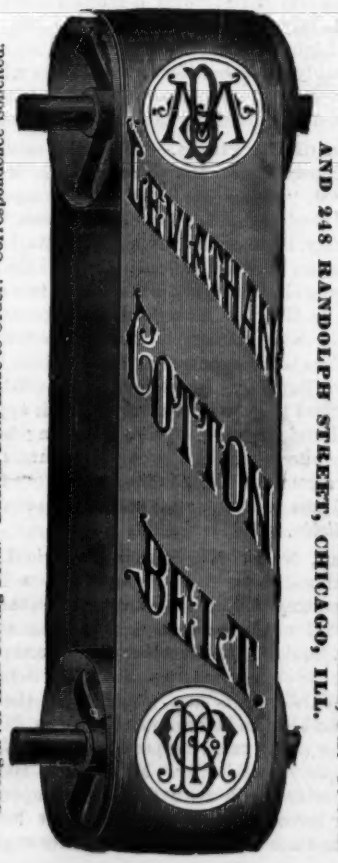

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